Vertical Hi-Stack Fan Coils

Catalog

zehnder Rittling

Heating | Cooling | Fresh Air | Clean Air

Zehnder – everything you need to create a comfortable, healthy and energy-efficient indoor climate

Heating, cooling, fresh and clean air: at Zehnder, you will find everything you need to create a comfortable, healthy and energy-efficient indoor climate. Zehnder's wide and clearly structured portfolio can offer the right product for any project, be it private, public or commercial, new build or refurbishment. And where service is also concerned, you'll find that Zehnder is "always around you."

Heating

At Zehnder, Heating doesn't just come in the form of designer radiators. We offer solutions in all shapes and sizes, from radiant ceiling panels to heat pumps with integrated ventilation devices.

- Designer radiators
- Compact energy station with integrated heat pump
- Heating and cooling ceiling systems
- Comfortable indoor ventilation with heat recovery

Zehnder Designer Radiators

Cooling

Zehnder also offers sophisticated solutions for indoor Cooling. These range from cooling ceiling systems to comfortable indoor ventilation with a supply of pre-cooled fresh air.

- Heating and cooling ceiling systems
- Compact energy station with heat pump and brine pipe
- Comfortable indoor ventilation with geothermal heat exchanger for fresh air pre-cooling

Zehnder Heating and Cooling Ceiling Systems

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around you

Fresh Air

Fresh Air – a product range with a long tradition at Zehnder. Zehnder Comfosystems provides products and solutions for comfortable indoor ventilation with heat recovery for houses and apartments, for new builds and for renovation projects.

- Comfortable indoor ventilation
- Compact energy station with integrated ventilation device

Zehnder Comfosystems

Clean Air

Zehnder Clean Air Solutions provide Clean Air in buildings particularly prone to dust. In residential applications, the comfortable indoor ventilation provided by Zehnder Comfosystems filters external pollutants out of the air.

- Comfortable indoor ventilation with integrated fresh-air filter
- Compact energy station with integrated fresh-air filter
- Systems for clean air

Zehnder Clean Air Solutions

Industry innovation and customer satisfaction

Zehnder Rittling Fan Coils are showing up in new building construction, renovated offices, residential complexes and educational institutions across North America. Zehnder Rittling Fan Coil products stand out of the crowd based upon their unique heavy-duty construction and custom applications capability. All Zehnder Rittling Fan Coils are the result of years of research on the latest hydronic coil and fan technology available. Designed for permanent balance and strength for years of trouble-free performance. Custom hand-built solutions for retrofit and replacement are part of our everyday life.

Zehnder Rittling Fan Coils are available in a wide range of models and air flow arrangements to satisfy the demands of your heating and cooling specifications. If you do not see it here, consult your local Zehnder Rittling representative; If you can draw it, we can build it!

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Features and benefits

For the owner

The Vertical Hi-Stack Fan Coil is a high quality unit that is competitively priced, the quietest in the industry, and can be installed quickly. A faster installation keeps costs down and allows the building to be occupied on time or even ahead of schedule.

All units are ETL certified, complying with applicable standards for safety and performance. All wiring is in compliance with NEC providing the owner with a safe, high quality system.

The return air front panel is 18-gauge epoxy powder coated steel which can be upgraded to 16-gauge construction for a more dent-resistant front panel.

EC motors provide a high efficiency, lower operating cost option.

The Vertical Hi-Stack unit is easily serviced and maintained. The return air front panel is simply removed to access the coil, drain pan and blower deck for cleaning. The entire blower assembly can be quickly removed from the unit for servicing by simply disconnecting the motor quick connect and sliding out the blower deck. The assembly can be serviced on a workbench limiting equipment down time. The coil is removable for service or replacement. The drain pan is positively sloped to reduce the threat of mold and bacteria thereby improving indoor air quality. The drain pan can be constructed from 304 stainless steel to eliminate corrosion and increase equipment life span. Valves and thermostat wiring are also easily accessible. Visual inspection and routine maintenance, including filter replacement, is trouble-free.

Back-to-back units and master-slave units can be supplied with one layer of 5/8" fire-rated gypsum board in pipe chase for a one hour fire rating per UL 1479.

For the engineer

The broad range of standard options associated with the Vertical Hi-Stack Fan Coil provide the needed flexibility to fit a wide range of applications. These units can be placed in a multitude of arrangements, taking into account the aesthetics and space requirements of the room.

The modular design minimizes the installed system cost. It includes the factory-assembled riser piping with insulation, valve packages, quick-connect motor and thermostat wiring, and other accessories. Other options include 304 stainless steel drain pan, aluminum double deflection supply grille, aluminum return grille, manual and automatic outside air damper, cleanable filters and electric heat.

Fan coil unit capacities are certified under Industry Room Fan Coil Air Conditioner Certification Program in accordance with ARI Standard 440-98. All standard units are ETL certified in the U.S. and Canada and comply with UL 1995 requirements.

Choose from 3 or 4 row cooling coils and 1 or 2 row heating coils for flexibility during the design process (max. of 5 total rows).

For the contractor

Lower installation costs are realized by shipping the units fully assembled with the insulated risers attached to the unit, the electrical components pre-wired and the control valves pre-piped, resulting in less installation labor in the field. All units are quality inspected and tested in the factory prior to shipment.

The pre-piped risers and valve packages reduce the pipe connections that need to be made by the mechanical contractor. The design of the Vertical Hi-Stack Fan Coil system allows the units to be set in place, floor by floor, one on top of the other in a vertical column. Each riser is swaged at the top to allow the quick insertion of the riser from the unit on the above floor. The swaged riser design drastically reduces the time and expense associated with brazing as compared with slip-coupling connectors.

Factory supplied risers with swaged connections are available in a number of different diameters, tube thicknesses, and lengths.

Thermostat controls can be wall mounted at the unit or remotely depending on the application. Features include manual or automatic changeover, factory pre-wired with quick connect, 24V or 120V, on/off system switch and fan speed selector. The thermostat and motor are supplied with a quick connect for easy field assembly. The electrical contractor is only required to bring power to the unit and plug in the thermostat.

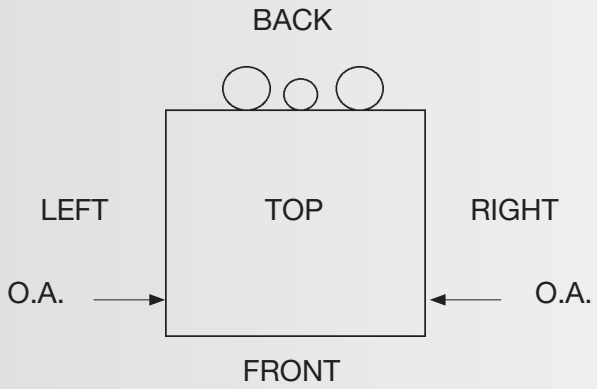
The units are palletized, tagged and can be shipped according to customer request, thus eliminating extra labor costs, delays and equipment damage associated with sorting equipment on site.

Airflow arrangements

Riser and supply air discharge designations

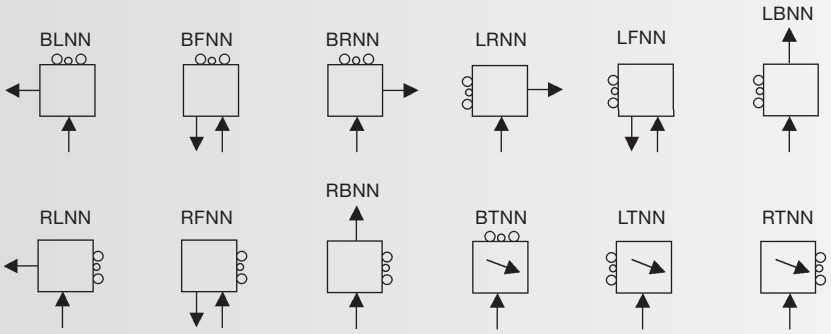
Example: BFNN
B = Riser location
F = Supply air 1 location
N = Supply air 2 location
N = Outside air location

Notes:
- Return air always in front of unit.
- Access to internal components always through front panel.
- Sight and sound baffles provided as required, ordered separately.
- Sight and sound baffle not available with top outlet configurations.
- The above arrangements apply to hideaway and master units only. Slave units and hideaway units without risers have piping connections where pipes are shown in diagrams to the right.
- Outside air available on left or right side of unit opposite riser side. Available on both sides with back riser location.
- Optional riser chase available for hideaway units. Contact factory for pricing.

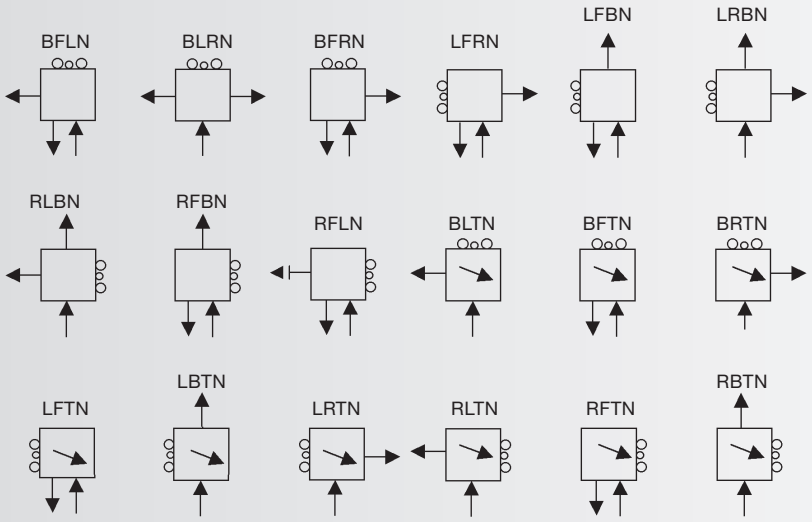


B	F	L	R	T	N
Back	Front	Left	Right	Top	None

Single supply

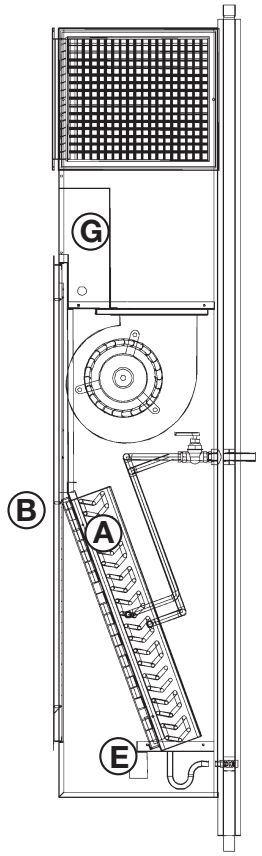


Double supply

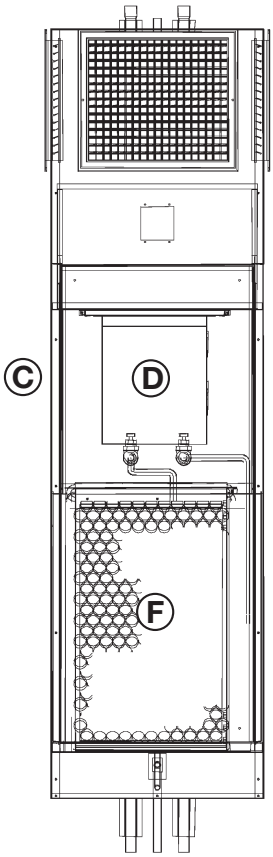


Features

SIDE VIEW



FRONT VIEW



A: 3 row chilled water coil

- Sturdy, mechanically-bonded copper/aluminum coil with 12 fins per inch, 1/2" nominal tubes and 0.016" tube wall thickness.
- High BTU capacity with low noise, vibration and amp draw.
- Coil assemblies tested for a maximum of 300 psig working pressure.
- Maximum of 5 coil rows total.
- Easily removable for service.
- Manual air vents.

B: Return air access panel

- 18-gauge heavy duty panel with stamped louvers protects against impact. (Shipped loose for field installation)
- Tamper-resistant quarter-turn fasteners provided as standard.
- Attractive ivory epoxy powder coating.
- Flush mounted.

C: Cabinet

- 20-gauge galvanized steel construction.
- 1/2" thick 2 lb. density matt-faced fiberglass insulation furnished to dampen sound and provide thermal efficiency.
- Field configurable riser slot knockouts.
- Field configurable supply air knockouts.

D. Removable blower fan housing/motor assembly

- Operating ampere ranges from 0.4 amps (265 CFM) to 3.2 amps (1230 CFM), 120/60/1.
- Multi-speed permanent split capacitor (PSC) motors for extended, reliable motor life, low operating cost and quiet operation.
- Removable assembly on slide out rails with motor quick connect and single screw removal.

E: Drain pan

- Fire retardant ABS plastic.
- Positively sloped to ensure proper drainage and maximize protection against microbial growth.
- Fully insulated externally with closed cell insulation.
- Removable, flexible rubber P-trap factory installed.
- 7/8" O.D. drain connection.

F: Filter

- 1" MERV 4 disposable spun glass media slides easily into filter rack.

G: Control box

- Accessed by removing front panel.
- Terminal blocks for field connections.
- Single point power connection.

Options and accessory equipment

Factory assembled

Cabinet
- 14-gauge and 16-gauge return panels.
- Extended return panel for greater control box access.
- Perimeter bypass panel.
- Key lock.
- Torx-head 1/4 turn fastener.
- Contact factory for exposed epoxy powder coat painted cabinets and/or double wall construction.
- Duct collars.
- Custom cabinet dimensions (contact factory).
- Master/slave arrangement.

Insulation
- 1/2" fiberglass.
- 1/2" closed cell.
- 1/2" foil-faced fiberglass.

Coils
- Stainless steel coil casing(s).
- High BTU capacity with low noise, vibration and amp draw.
- Coil assemblies tested for a maximum of 300 psig working pressure.
- Maximum of 5 coil rows total.
- Easily removable for service.

Chilled water
- 4 row chilled water cooling coil.
- Sturdy, mechanically-bonded copper/aluminum coil with 12 fins per inch, 1/2" nominal tubes and 0.016" tube wall thickness.
- Manual air vents.

Hot water
- 1 or 2 row hot water heating coil used in 4-pipe systems.
- Sturdy, mechanically-bonded copper/aluminum coil with 12 fins per inch, 1/2" nominal tubes and 0.016" tube wall thickness
- Manual air vents.

Automatic air vent
- Efficient way to automatically remove air from the system.

Electric heat
- Single stage or intermediate season electric heating.
- Nickel chromium electric heating element(s).
- Located in the reheat position.
- Unit mounted linear limit primary safety control, fusible link secondary safety device, and field wiring terminals.
- Single point power connection.
- Contact the factory for quiet contactor, SCR control or two stage options.

Sight and sound baffles
- For units with multiple supply air grilles serving two different rooms.

Drain pan
- 304 stainless steel.
- External surface fully insulated with 1/4" closed cell insulation.
- Removable drain pan.

Condensate pump
- 120/60/1 pump for removing up to 5.0 gph. Includes GFCI.
- Contact the factory for other voltages.

Motors
Alternate voltage
- 208/60/1, 230/60/1, 277/60/1 supply voltage.

- **High static**
- 120/60/1, 208/60/1, 230/60/1 and 277/60/1 motors to handle up to 0.6" of external static pressure.

EC motors
- Electronically commutated motors (ECM) are high efficiency, programmable, brushless DC motors that utilize a permanent magnetic rotor and built-in inverter.
- Low operating cost and ultra-quiet operation.
- Separate 2-10 VDC or 3-speed control card is included.

Disconnect switch
- 120/60/1, 208/60/1, 230/60/1 or 277/60/1, located in control box.

Motor starter
- 120/60/1, manual reset motor starter with toggle switch and thermal overload protection.
- Unit can only be restarted by resetting toggle switch.
- Starter comes with an overload protection set at 125% of full load current.
- Not available with electric heat.
- Contact factory for alternate voltages.

GFCI
- 120/60/1, ground fault circuit interrupter, unit mounted, field wired.

Condensate level switch
- 24V power.
- De-energizes fan upon rising condensate water level.

Dampers
0 to 25% manual outside air damper
- Includes damper, manually adjustable through return air opening.

0 or 25% motorized outside air damper

- Operational at 0% or 25% outside air.
- Furnished with 120/60/1 synchronous motor wired to blower
- Automatically opens the damper when the fan starts.
- Damper returns to the closed position when power is off or interrupted.

Filters

Cleanable aluminum mesh

- 1" filter complete with aluminum frame and drain holes.

MERV 8, 11, 13

- 1" high efficiency, pleated throwaway filter.

Synthetic media filter

- 1" polyester fiber filter.

Controls

- Valve control by air temperature.
- Fan control by air temperature.
- Valve control by water temperature.
- Low voltage packages.
- See page 19-30 for detailed information on control packages.
- Mounted 3-speed fan switch (shipped loose).
- Main fusing.

Thermostats

- Electronic, non-digital.
- Digital, non-programmable.
- Digital, 7-day programmable.
- Unit or remote mounted.
- Provided with quick connect for easy field installation
- ADA mounting.
- See pages 19-29 for detailed information on control packages.

Color

- Epoxy powder coated paint.
- Additional standard colors.
- Furnish color chip for custom color.

Valve packages

- 1/2" two-way and three-way normally closed, electric control valves.
- Two position, 120V or 24V.
- 3-wire floating or proportional, 24V.
- Low & high differential pressures.
- Fixed and adjustable flow control devices.
- Y-strainer.
- Ball valves.
- P/T ports.
- Unions.
- Flexible stainless steel braided hoses.
- See page 15-18 for detailed information on valve packages.
- Contact the factory for steam valves or customer supplied valves.

Risers

- Type L and M copper with 3" deep swaged connection. Contact the factory for type K copper.
- 3⁄4", 1", 1-1⁄4", 1-1⁄2", 2", 2-1⁄2" diameter. Contact the factory for 3" diameter.
- 1/2" and 3/4" closed cell insulation.
- Capped top or bottom.
- Riser extensions.
- Ship loose risers available upon request.
- Contact the factory for lengths greater than 115" and/or to have no swage at riser ends to accommodate solder-free fittings.

Field assembled

Grilles

- Aluminum fixed bar return air grille, full front panel.
- Single or double deflection discharge air grille(s).
- Opposed blade damper discharge air grille(s).

Changeover switch

- Switches a thermostat from heating to cooling based on a change in supply water temperature.
- Mounts to supply piping with a simple spring clip included with the switch.

Remote temperature sensor

- Operates with all standard Zehnder Rittling control packages.
- Requires removal of JP1 jumper internal to electronic, non-digital thermostat.

Table A: AHRI approved standard ratings

Unit size		03	04	06	08	10	12
Certified cooling capacity (3 row main coil)	Total MBH	12.4	16.1	19.6	25.7	31.9	34.8
	Sensible MBH	8.4	11.4	14.8	17.2	24.8	27.6
	GPM	2.5	3.2	3.9	5.4	6.4	7.2
	PD, ft. of H_2O	6.7	11.0	15.4	13.6	18.7	23.3
Certified cooling capacity (4 row main coil)	Total MBH	14.3	18.2	24.3	29.2	39.7	43.1
	Sensible MBH	9.6	12.1	16.5	20.2	29.3	31.8
	GPM	2.8	3.8	4.9	5.7	7.7	8.3
	PD, ft. of H_2O	11.1	19.1	30.6	18.3	31.9	37.2
Heating capacity (3 row main coil)	MBH	34.2	43.7	66.1	75.7	105.6	116.3
	GPM	3.5	4.5	6.8	7.8	10.8	11.8
	PD, ft. of H_2O	10.7	16.9	36.8	22.5	42.1	50.4
Heating capacity (4 row main coil)	MBH	36.3	47.3	74.3	83.1	119.5	133.0
	GPM	3.7	4.8	7.6	8.5	12.2	13.6
	PD, ft. of H_2O	15.1	24.8	57.7	32.6	64.3	78.6
Heating capacity (optional 1 row reheat coil)	MBH	19.9	23.7	31.6	38.6	48.6	52.0
	GPM	2.1	2.4	3.2	4.0	4.9	5.3
	PD, ft. of H_2O	7.5	10.3	17.3	7.1	10.9	12.3
Heating capacity (optional 2 row reheat coil)	MBH	29.2	36.3	52.1	61.2	80.7	88.8
	GPM	3.0	3.7	5.3	6.3	8.3	9.1
	PD, ft. of H_2O	5.8	8.7	17.3	8.2	13.8	16.5
CFM	High	320	450	680	700	1120	1280
	Medium	250	325	450	600	700	850
	Low	170	250	330	510	600	630
CFM, high static (@ 0.2" ESP)	High	300	420	790	825	970	1230
	Medium	255	350	480	515	575	1020
	Low	230	290	350	415	400	530
Coil	FPI	12	12	12	12	12	12
	Face area, ft.^{2}	2.5	2.5	2.5	3.75	3.75	3.75
	Coil connections	1/2" Cu	1/2" Cu	1/2" Cu	1/2" Cu	1/2" Cu	1/2" Cu
Blower	Quantity	1	1	1	1	1	1
	Diameter	6.6	6.6	6.6	8.8	8.8	8.8
	Width	7.0	7.0	7.0	9.5	9.5	9.5
Filter	Number	1	1	1	1	1	1
	Length, in.	30	30	30	30	30	30
	Width, in.	12.5	12.5	12.5	18.5	18.5	18.5
	Thickness, in.	1	1	1	1	1	1
Cabinet size	Height, in.	88	88	88	88	88	88
	Length, in.	18	18	18	18	18	18
	Width, in.	18	18	18	24	24	24
Minimum free area	Inlet, in.^{2}	314	314	314	450	450	450
	Outlet, in.^{2}	168	168	168	224	224	224
Base unit shipping weight, lbs.		170	170	170	225	225	225
Base unit operating weight (5 coil rows), lbs.		185	185	185	245	245	245
(4) 2" risers and (1) 1" riser shipping weight, lbs.		100	100	100	100	100	100

Notes:

- Airflow under dry conditions. Inlet air 70-80 °F DB.
- Cooling capacity based on inlet air 80 °F DB, 67 °F WB, 45 °F entering water, 55 °F leaving water, high fan speed.
- Heating capacity based on inlet air 60 °F DB, 180 °F entering water,
- 160 °F leaving water, high fan speed.
- Pressure drop (PD) shown in feet of water.

Table B: Electrical data

	Motor type		03	04	06	08	10	12
HP	PSC	Standard	1/25	1/12	1/12	1/5	1/5	1/4
		High static	1/5	1/5	1/5	2/5	2/5	2/5
	ECM	Standard	1/4	1/4	1/4	1/4	1/4	1/4
		High static	1/4	1/4	1/4	1/4	3/4	3/4
RPM high		Standard	675	900	1235	570	860	1035
		High static	1020	1070	1540	810	1030	1190
RPM medium		Standard	500	650	860	500	570	690
		High static	960	990	1050	720	810	1040
RPM low		Standard	375	525	620	465	500	520
		High static	900	930	970	660	720	800
Motor FLA 120V/60Hz/1Ph	PSC	Standard	0.40	1.76	1.76	2.35	2.35	3.20
		High static	2.40	2.40	2.40	5.50	5.50	5.50
	ECM	Standard	0.80	1.50	2.77	2.41	3.53	4.74
		High static	1.25	1.61	3.79	3.35	4.13	5.54
Power input: watts 120V/60Hz/1Ph	PSC	Standard	44	118	185	180	308	396
		High static	111	133	269	284	478	614
	ECM	Standard	33	61	116	62	177	261
		High static	56	71	253	107	239	345
Motor FLA 208-230V/60Hz/1Ph	PSC	Standard	0.20	0.20	0.94	1.50	1.50	1.80
		High static	0.90	0.90	0.90	3.00	3.00	3.00
	ECM	Standard	0.30	0.49	1.69	1.47	2.68	3.60
		High static	0.76	0.98	2.32	2.05	3.14	4.22
Motor FLA 277V/60Hz/1Ph	PSC	Standard	0.18	0.18	0.74	1.28	1.28	1.46
		High static	1.00	1.00	1.00	2.40	2.40	2.40
	ECM	Standard	0.30	0.49	1.69	1.47	2.02	2.71
		High static	0.76	0.98	2.32	2.05	2.37	3.18

Notes:

- Maximum circuit ampacity (MCA) = 1.25 x (FLA motor 1 + FLA motor 2 + FLA electric heat)
- Maximum overcurrent protection (MOP) = (2.25 x FLA motor 1) + FLA motor 2 + FLA electric heat
- If the calculated MOP is within 10% of the next smaller available fuse size, that fuse size shall be used. If not, the next larger fuse size above the calculated MOP must be used.
- If the selected MOP is smaller than the MCA, the selected MOP must be increased to the next larger available fuse size above the MCA.
- If the MOP is less than 15, it shall be rounded up to 15 amps. This is the minimum fuse or circuit breaker permitted by code.
- EC motor nameplate amperage indicates the motor hardware peak amperage while the motor full load amperage (FLA) is limited by the motor's factory programmed operating range, programmed specifically for each unit size. The programmed operating range is generally only a portion of the motor hardware full potential resulting in the motor FLA being lower than the nameplate FLA. Motor FLA will be reflected on the Fan Coil serial tag and should be used when sizing building electrical requirements.

Installation and application

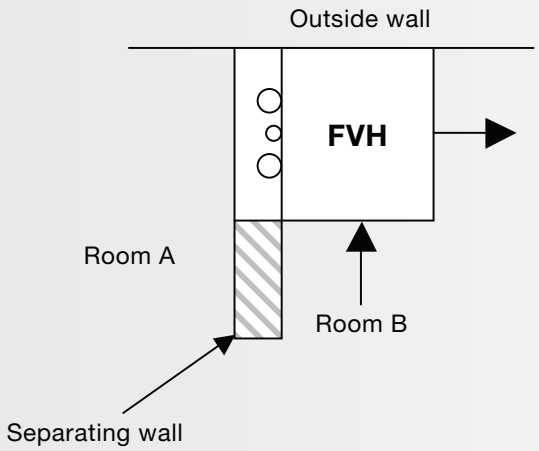
Installation comparison

Vertical Hi-Stack vs. horizontal concealed or vertical closet units

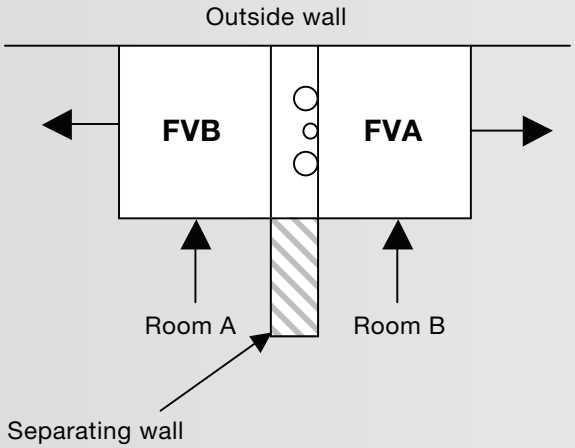
Features	Vertical Hi-Stack	Horizontal or vertical units
Duct work	Integral to cabinet	Separate purchase and field installed
Discharge air plenum	Integral to cabinet	
Supply air grille	Standard option	
Return air grille	Integral to cabinet	
Thermostat wiring	Factory installed	
Risers and control valves	Factory installed	
Hanger rods and support brackets	Not applicable	
Dropped ceiling or closet	Not applicable	
P-trap for condensate line	Factory installed	

Not only will the Zehnder Rittling Vertical Hi-Stack provide tremendous installation savings for the contractor and owner but it will also offer a virtually unlimited selection of arrangement options for the designer. Shown here are the three model types to choose from when designing your building. Consult the factory for special applications.

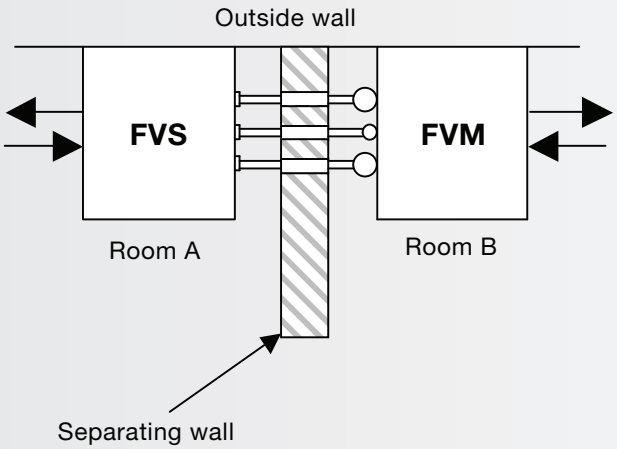
Hideaway



Back-to-back



Master/slave



System piping arrangements

Shown to the right are some of the common piping layouts for the Zehnder Rittling Vertical Hi-Stack Fan Coils. Two-pipe systems are depicted, but the same methods can be applied to four-pipe systems. Regardless of the system selected, optimum performance can only be achieved through adjustment of the water flow at each individual unit.

Direct return

This system is the most common piping arrangement referred to as “direct return.” This is the most cost effective method of piping to install since the water is supplied and returned to a riser column at the same place, at the bottom or top of the building. However, this type of system requires more effort to individually balance water flow to the units. The risers are normally capped at the ends opposite the main supply and return piping and may require a field installed flush and vent loop.

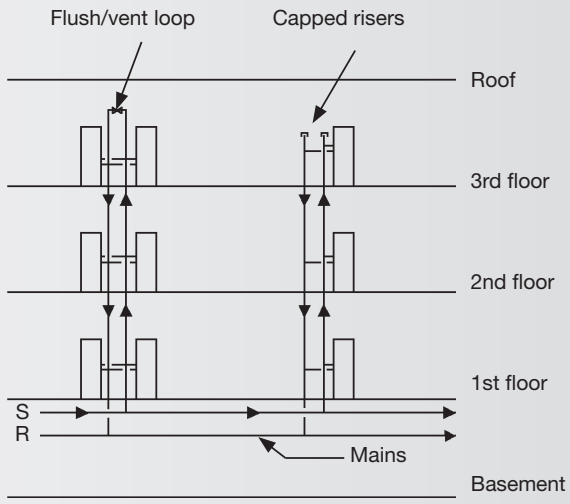
Reverse return with individual return

This system is a “reverse return” system, which is commonly used to minimize individual unit water flow balancing and is often referred to as “self balancing.” This riser arrangement has a natural affinity to balance the flow to each unit in the riser column. However, individual unit balancing may still be required. This piping system is used on 2-pipe systems only and has an individual return for each riser column.

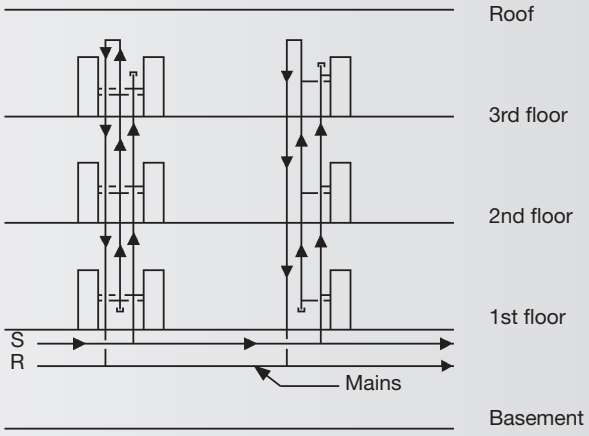
Reverse return with common return

This system is a “reverse return” with a common reverse return riser installed separately from the individual unit riser columns. This riser arrangement allows for more flexibility in individual unit riser sizing but has the same general characteristics as the “reverse return” system described above. It may also be a better fit for the particular structural and architectural requirements of the building. This piping system may also be used on 4-pipe systems.

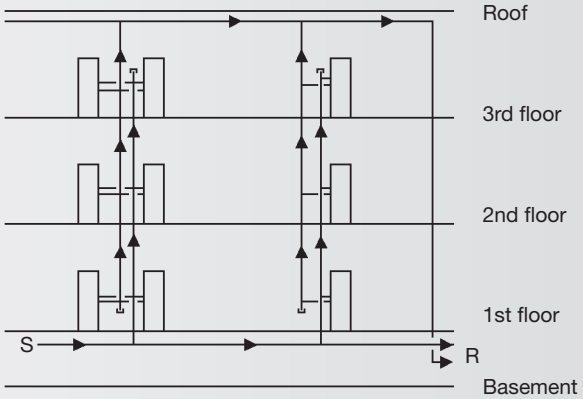
Direct return



Reverse return with individual return



Reverse return with common return



Riser material, sizing, installation and expansion

Some of the factors affecting riser application and sizing are noise, tube erosion and economics. Since each Vertical Hi-Stack Fan Coil unit may be supplied with factory installed risers, the riser material, diameter, length and insulation thickness must be determined for each unit based on its positioning within the building.

The Friction Loss for Risers Table displays riser tube diameter sizes as a function of flow (GPM), friction loss and water velocity. For maximum riser velocity on pressure drop per 100 feet, refer to ASHRAE 2001 Fundamentals 35.3 Table 6 for riser sizing. Generally, riser copper type, size, length and insulation thickness are determined by the location of the fan coil unit in the building. Chilled water, hot water, and condensate risers are available in type M or type L copper, varying diameters from 3/4" to 2 1/2", and with either 1/2" or 3/4" thick closed cell foam insulation. All factory supplied risers and riser extensions are insulated for the full length of the riser, eliminating the need for field insulation. Any concerns regarding excessive expansion and between-the-floor fireproofing have not been addressed in the Zehnder Rittling design and any additional materials to accommodate these concerns are to be field supplied and installed using proper building practices and local building codes.

Riser sizing is generally based on the water flow requirements of each unit and the units on higher and lower floors that tie into the same riser column depending on the piping system chosen. Water piping is often designed at approximately 4-5 ft/s for system economy, consistent with minimizing riser erosion and noise. Keeping this in mind, risers can be reduced in size as the water flow decreases from floor to floor. For low-rise buildings, riser sizes can be of a single diameter. The reduced material handling on site will often offset extra costs associated with larger risers.

Generally, in medium to high-rise buildings, allowances must be made for pipe expansion. Vertical Hi-Stack Fan Coils are furnished with integral copper expansion loops that allow up to 1" of riser expansion and contraction. Additional expansion compensation must be made in the riser system in the field where movement is expected to exceed factory allowances. The table showing allowable riser lengths between system expansion loops displays expansion characteristics of risers compared to water temperature differential. Assuming a hot water temperature of 150 °F and
45 °F chilled water, the temperature difference of 105 °F indicates 95 feet of riser will expand or contract 1". To eliminate stress, a riser system must be anchored to the building structure at least once. Technical information on pipe expansion, contraction and anchoring can be found in the ASHRAE HVAC Systems and Equipment Handbook and various other technical publications. Riser expansion and anchoring is the responsibility of the design engineer and installing contractor.

Table C: Friction loss for risers

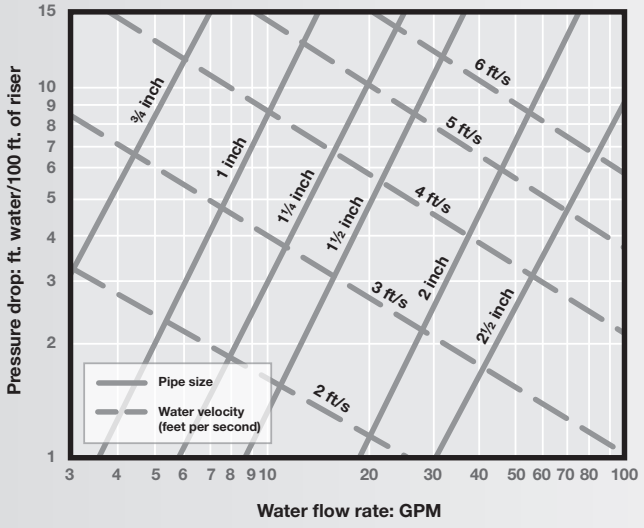
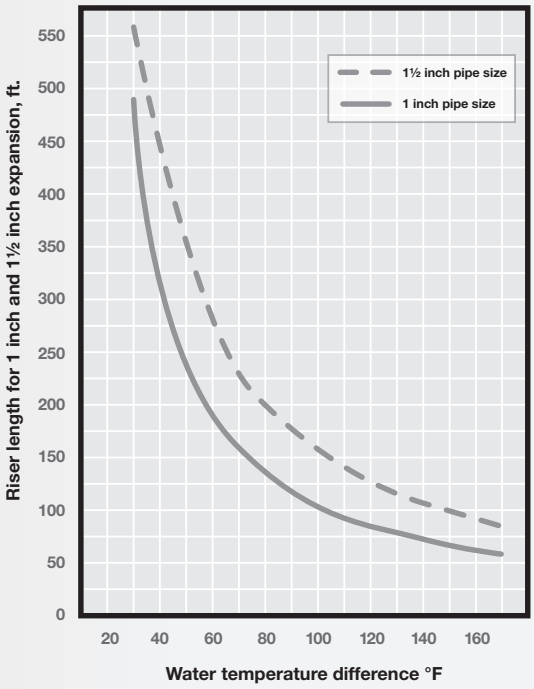


Table D: Allowable riser lengths between system expansion loops



Pressure ratings

The following C_v factors table is used to determine the pressure drop of various factory furnished piping package components and accessories. C_v factors are based on standard valve package components and are figured at full open position.

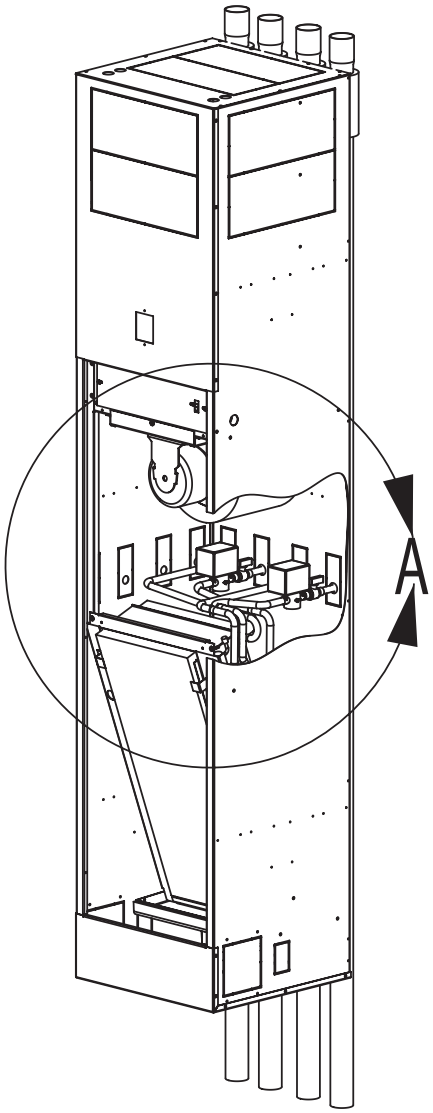
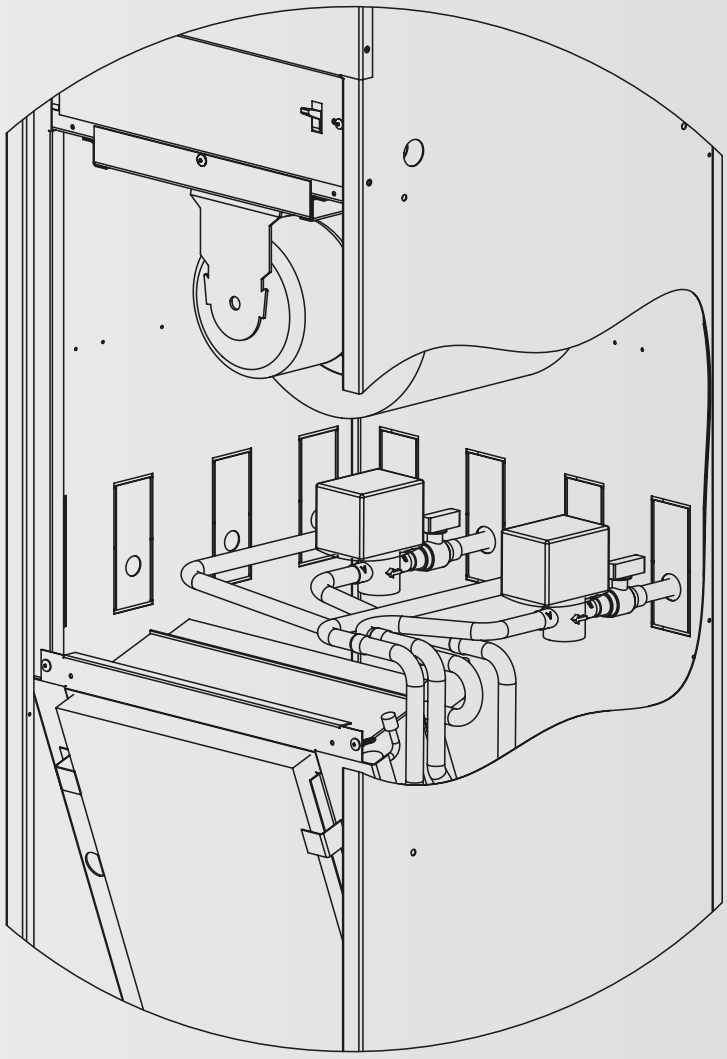


Table C: C_v factors for valve package components

Port dia.	Ball valve	General close-off ΔP		High close-off ΔP		Bal. valve	Manual circuit setter	Auto circuit setter/ball valve*	Strainer/ ball valve
		2-way control valve	3-way control valve	2-way control valve	3-way control valve				
1/2"	17	3.5	4	1	1.5	3	2.3	14	5.5
3/4"	40	3.5	4	2.5	3	5	2.3	14	9

* Based on valve body only



Example

Find the pressure drop in feet of head (ft-H_2O) for size 03 unit at 2.4 GPM with the following:

- 3 row coil
- (1) 1⁄2" ball valves
- (1) 1⁄2" manual circuit setter
- (1) two-way control valve, general close-off ΔP

(GPM/C_v 1⁄2" ball valve)^2 + (GPM/C_v manual circuit setter)^2 + (GPM/C_v two-way valve)^2 = WPD (psi)

- 0.02 + 1.09 + 0.47 = 1.58 psi
- 1.58 psi x 2.31 ft-H_2O/psi = 3.65 ft-H_2O
- 3.65 ft-H_2O + 7.3 ft-H_2O (from Table A) = 10.9 ft-H_2O

Octave band sound power ratings

Table D: vertical hi-stack octave band sound power level

dB RE 1x10^{-12} watts

Unit size	Motor speed	CFM	Octave bands						
			2	3	4	5	6	7	8
			Center frequency (CPS)						
			125	250	500	1000	2000	4000	8000
03	High	320	55.5	43.5	38.0	27.0	25.5	25.5	28.0*
	Medium	265	47.5*	38.0	33.0	23.0*	19.0*	23.0*	28.0*
	Low	180	44.0*	32.5*	30.0	22.0*	19.0*	23.0*	28.0*
04	High	425	60.0	48.0	48.5	31.5	31.5	31.0	29.0*
	Medium	290	51.5*	40.5	35.5	25.0	22.0*	22.0*	28.0*
	Low	200	45.0*	34.5*	31.0	22.5*	19.0*	22.0*	28.0*
06	High	680	69.5	59.0	53.5	44.5	45.5	46.0	42.5
	Medium	450	61.0	49.0	49.0	33.0	33.0	32.5	29.0*
	Low	330	53.5	43.5	43.0	24.5	20.0*	23.5	28.0*
08	High	700	62.0	50.5	44.5	38.0	34.5	31.5	29.0
	Medium	600	59.0	47.5	43.5	34.0	30.0	27.0	27.5*
	Low	510	57.0	45.5	40.0	31.5	26.5	25.0	27.5*
10	High	1120	70.5	60.0	54.5	50.0	47.5	45.5	39.5
	Medium	700	62.0	50.5	44.5	38.0	34.5	31.5	29.0
	Low	600	59.0	47.5	43.5	34.0	30.0	27.0	27.5*
12	High	1280	76.5	65.5	59.5	56.5	55.0	53.5	48.0
	Medium	850	66.0	54.0	48.5	42.5	40.5	37.5	32.0
	Low	630	59.5	49.0	41.0	33.0	29.0	25.5	30.0

Notes:
The method used in conducting this test was based on the AHRI Standard 350-2008 “Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment” and was conducted by an independent third party

* Ambient background noise has contributed to higher number. Actual unit noise is less.

Valve packages general data

Factory mounted valve packages

All units have standard valve packages available as a factory installed option for the main cooling coil and optional heating coil. All valve packages are manufactured within strict tolerances and are hydrostatically tested for leaks. All valve package components are solder end connections. Electric valves are wired to terminal blocks when selected. All cooling piping and components are located directly above the drain pan to allow condensate to be captured and properly drained. Insulation of the factory valve package is not required.

■ **Valve package components**
Zehnder Rittling valve packages consist of a variety of components and selection of each combination is dependent upon the application. The following sections provide a detailed description of each of the components. Following this section are additional schematic illustrations and mechanical specifications and photos.

■ **Piping system/placement**
Valve packages are available for two- or four-pipe systems. The riser connections can be located on the left, right or back side of the unit.

■ **Interconnecting Piping**
Interconnecting piping refers to the copper piping attached to the coil connections to which all other components (i.e. control valves, ball valves, circuit setters, etc.) are attached. Piping is 1⁄2" nominal (5⁄8" OD) copper.

■ **Deluxe or basic packages**
The basic valve package includes only the main components of the valve package (i.e., interconnecting piping, control valves, and end valves). The deluxe valve packages also include unions at the coil connections and a strainer on the supply water pipe along with the basic components. All valve package components are solder end connections.

■ **Unions**
Feature cast bronze construction and close with a minimum amount of effort. Used for quick connect and disconnect of valve package components to minimize required field labor during servicing of the unit.

■ **Strainer**
The Y-type strainer body is constructed of brass with a 16 mesh 304 stainless steel screen. Used for removal of small particles from the water supply pipe during normal system operation. The strainer helps protect the coil and minimizes the chance of control valves clogging. Screens should be regularly removed and cleaned as part of a routine maintenance schedule.

■ **Balance valves**
The valve body is constructed of bronze and is used to balance hydronic circuits.

■ **Stainless steel hoses**
Flexible 302/304 stainless steel hose with EPTF inner tube and JIC flare connections. Meets UL-94 VO fire rating.

■ **P/T ports**
An accessible port where pressure and temperature can be measured. Accepts standard 1/8" gauge adapter or thermometer stem.

End valves

Each valve package includes a ball valve for the supply water pipe and one of the following end valves on the return water pipe; ball valve, manual circuit setter, or automatic circuit setter. Consult the factory for inclusion of other types of valves as end valves.

■ **Ball valves**
Ball valves, aka end valves, allow the unit to be cut off for servicing purposes. They have a low resistance to water flow, operate easily, and are often used for water balancing. These valves have a compact handle that rotates 90 degrees to a fully open position.

The valve body is forged brass and the ball is polished brass with virgin Teflon seats and seals. Ball valves are available as end valves on both the supply and return water pipes.

■ **Manual circuit setter**
A manual circuit setter, aka manual flow control valve, acts as both a flow setting device and a stop valve, taking the place of a ball valve. This valve allows water flow through the fan coil unit and can be set quickly and accurately. Manual circuit setter includes two measuring ports in the valve body to be used for pressure drop measurements during system balancing. This pressure drop can be compared to factory supplied curves showing the corresponding flow rate. This valve has a handwheel with memory feature including a locking feature for tamper proof setting.

■ **Automatic circuit setter**
An automatic circuit setter is an automatic flow control device that includes a ball valve cast in the valve body and is located on the return water pipe. The automatic circuit setter consists of a stainless steel/brass flow cartridge and a contoured orifice plate.
As the pressure drop increases, the flow cartridge will move into the contoured orifice plate to decrease the flow. This flexing action provides a constant flow, independent of pressure (2-80 psi), makes it difficult to clog and resistant to cavitation damage. This valve sets flow through the coil without any action required by a system balancer.

Control valves

Valve packages are available with or without control valves.

■ **2-way on/off valves**
These 1⁄2" valves are normally closed to the coil as standard and will isolate the coil during a loss of power. Normally open valves are also available upon request. Upon response to a signal from the controller, the valve will be either fully open or fully closed. These valves are located in the water supply pipe and have a C_v of 3.5, and close off ΔP of 25 psi. A high pressure close off valve is offered with a C_v of 1.0 and close off ΔP of 75 psi. A means of relieving head pressure must be accounted for when two-way valves are selected, most notably when used in combination with automatic changeover.

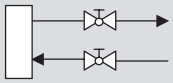
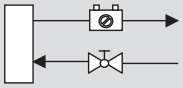
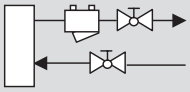
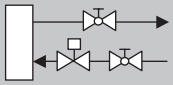
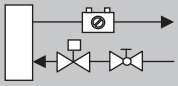
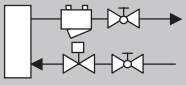
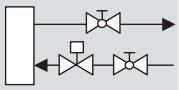
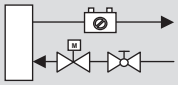
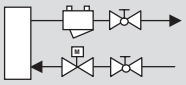
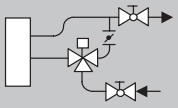
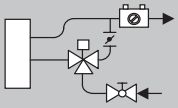
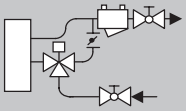
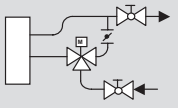
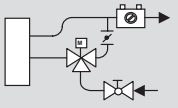
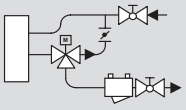
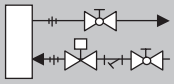
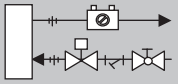
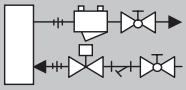
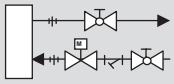
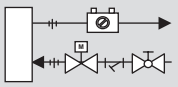
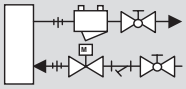
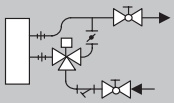
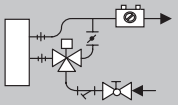
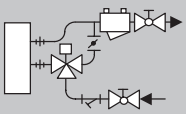
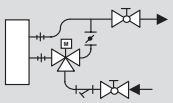
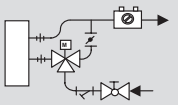
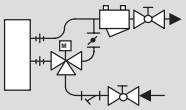
■ **3-way on/off valves**
These 1⁄2" valves are normally closed to the coil as standard and will isolate the coil during a loss of power. Normally open configurations are simply achieved by turning the valve around. Upon response to a signal from the controller, the valve will be either fully open allowing full flow to the coil or fully closed to the coil diverting full flow to the bypass line. All three-way valve configurations include a balance fitting in the bypass line to allow proper flow balancing. These valves are located in the water supply pipe and have a C_v of 4.0, and close off ΔP of 25 psi. A high pressure close off valve is offered with a C_v of 1.5 and close off ΔP of 75 psi.

■ **2-way modulating valves**
1⁄2", 24V valves modulate the flow of water (0-100%) through the coil in response to a signal from the controller and are normally closed to the coil as standard. Normally open valves are also available upon request. Modulating valves are either three-wire floating equal percentage valves or proportional (0-10 VDC or 4-20 mA signal), designed for precise temperature control. All valves feature a magnetic clutch to extend the life of the motor and gear train, manual operating lever/position indicator facilitates field setup, and easy to use lever terminal blocks. These valves are located in the water supply pipe, have a C_v of 4.0, and close off ΔP of 20 psi. A high pressure close off valve is offered with a C_v of 1.0 and close off of ΔP of 50 psi. A means of relieving pump head pressure must be accounted for when two-way valves are selected, most notably when used in combination with automatic changeover.

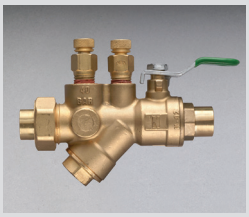
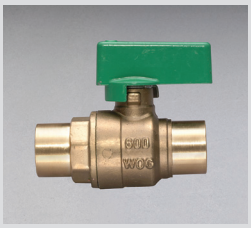
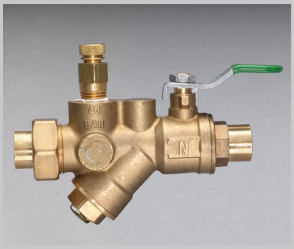
■ **3-way modulating valves**
These 1⁄2", 24V valves modulate the flow of water (0-100%) through the coil in response to a signal from the controller and are normally closed to the coil as standard. Normally open configurations are simply achieved by turning the valve around. Three-way valves allow the water supply from the water supply pipe to mix with bypass water from the bypass line. This mixture exits through the supply water pipe to the coil. Modulating valves are either three-wire floating equal percentage valves or proportional (0-10 VDC or 4-20 mA signal), designed for precise temperature control. All valves feature a magnetic clutch to extend the life of the motor and gear train, manual operating lever/position indicator facilitates field setup, and easy to use lever terminal blocks. These valves are located in the water supply pipe, have a C_v of 4.0, and close off ΔP of 20 psi. A high pressure close off valve is offered with a C_v of 1.0 and close off of ΔP of 50 psi.

Please contact Zehnder Rittling regarding any special valve requirements including hose kits, additional P/T ports, customer supplied valves, etc.

Pre-assembled, factory installed valve packages

	Basic	Manual circuit setter	Automatic circuit setter
None	**V-B1** Ball valve on return Ball valve on supply 	**V-B2** Manual circuit setter on return Ball valve on supply 	**V-B3** Auto circuit setter and ball valve on return Ball valve on supply 
2-way on/off	**V-B4E** Ball valve on return 2-way electric valve and ball valve on supply 	**V-B5E** Manual circuit setter on return 2-way electric valve and ball valve on supply 	**V-B6E** Auto circuit setter and ball valve on return 2-way electric valve and ball valve on supply 
2-way modulating	**V-B4M** Ball valve on return 2-way electric valve and ball valve on supply 	**V-B5M** Manual circuit setter on return 2-way electric valve and ball valve on supply 	**V-B6M** Auto circuit setter and ball valve on return 2-way electric valve and ball valve on supply 
3-way on/off	**V-B7E** Ball valve on return Balance fitting in bypass 3-way electric valve and ball valve on supply 	**V-B8E** Manual circuit setter on return Balance fitting in bypass 3-way electric valve and ball valve on supply 	**V-B9E** Auto circuit setter and ball valve on return Balance fitting in bypass 3-way electric valve and ball valve on supply 
3-way modulating	**V-B7M** Ball valve on return Balance fitting in bypass 3-way electric valve and ball valve on supply 	**V-B8M** Manual circuit setter on return Balance fitting in bypass 3-way electric valve and ball valve on supply 	**V-B9M** Auto circuit setter and ball valve on return Balance fitting in bypass 3-way electric valve and ball valve on supply 
2-way on/off	**V-D4E** Ball valve & union on return 2-way electric valve, ball valve, union and strainer on supply 	**V-D5E** Manual circuit setter and union on return 2-way electric valve, ball valve, union and strainer on supply 	**V-D6E** Auto circuit setter, union and ball valve on return 2-way electric valve, ball valve, union and strainer on supply 
2-way modulating	**V-D4M** Ball valve and union on return 2-way electric valve, ball valve, union and strainer on supply 	**V-D5M** Manual circuit setter and union on return 2-way electric valve, ball valve, union and strainer on supply 	**V-D6M** Auto circuit setter, union, and ball valve on return 2-way electric valve, ball valve, union and strainer on supply 
3-way on/off	**V-D7E** Ball valve and union on return Balance fitting in bypass 3-way electric valve, ball valve, union and strainer on supply 	**V-D8E** Manual circuit setter and union on return Balance fitting in bypass 3-way electric valve, ball valve, union and strainer on supply 	**V-D9E** Auto circuit setter, union and ball valve on return Balance fitting in bypass 3-way electric valve, ball valve, union and strainer on supply 
3-way modulating	**V-D7M** Ball valve and union on return Balance fitting in bypass 3-way electric valve, ball valve, union and strainer on supply 	**V-D8M** Manual circuit setter and union on return Balance fitting in bypass 3-way electric valve, ball valve, union and strainer on supply 	**V-D9M** Auto circuit setter, union and ball valve on return Balance fitting in bypass 3-way electric valve, ball valve, union and strainer on supply 

Valve packages component mechanical specifications

Component	Part	Material	Temperature	Working pressure
Union	Nut	Forged brass	325 °F maximum	600 psi
	Body			
Balance valve	Body	Bronze	220 °F maximum	300 °F psi
	O-ring	EPDM		
Automatic circuit setter and ball valve 	Body	Forged brass	325 °F maximum	600 psi
	Ball	Brass/chrome plated		
	Flow cartridge	Stainless steel/brass		
	Seals	Viton		
	Ball seal	PTFE		
Manual circuit setter	Body	Bronze	250 °F maximum	200 psi
	Ball	Brass		
	Seat rings	Glass and carbon filled TFE		
	O-ring	EPDM		
Ball valve 	Body	Forged brass	325 °F maximum	600 psi
	Ball	Brass/chrome plated		
	Seat	PTFE		
	Stem	Brass		
	Seals	Viton		
Strainer and ball valve with union 	Body	Forged brass	325 °F maximum	600 psi
	Ball	Brass/chrome plated		
	Seat	PTFE		
	Stem	Brass		
	Seals	Viton		
	Screen	304 stainless steel (20 mesh)		
Control valve	Body	Forged brass	200 °F maximum	300 psi
	Stem	Nickel plated/chrome plated brass		
	Seat	Brass		
	Paddle/plug	On/off: Buna N modulating: high temperature thermoplastic/rubber		
	Actuator	On/off: stainless steel base plate, aluminum cove modulating: high temperature plastic		

120 volt control packages

Zehnder Rittling provides a control system that includes a thermostat, control board with relays, manually operated three-speed fan switch and changeover switch (when required). For fan cycle operation, the thermostat cycles the fan from the selected speed to off. No control valve is provided in this operation. For fan/valve cycle operation, the thermostat cycles the fan and control valve. The fan runs intermittently unless the speed control switch is in the off position. Valve not included in control package price.

Zehnder Rittling provides a control system that includes a thermostat, control board, manually operated three-speed fan switch and changeover switch (when required). The thermostat cycles the electric control valve. The fan runs continuously. Valve not included in control package price.

Electronic on/off valve/thermostat control packages

Two pipe control, fan cycled or fan/valve cycled

Package number	Thermostat description	Fan motor speed switch location	Changeover switch
2F0D	On/off system switch and three-speed fan control but no changeover	Wall mounted, integral to thermostat	No
2F0F	Manual changeover, heat/off/cool system switch and three-speed fan control		Yes
2F0H	Auto changeover, on/off system switch and three-speed fan control		Yes

Notes:
- A means of relieving pump head pressure must be accounted for when two-way valves are used with an automatic thermostat package
- The fan cycles with demand for heating or cooling, but if the system switch is off, the fan is off

Two pipe control, valve cycled

Package number	Thermostat description	Fan motor speed switch location	Changeover switch
2V0D	On/off system switch and three-speed fan control but no changeover	Wall mounted, integral to thermostat	No
2V0F	Manual changeover, heat/off/cool system switch and three-speed fan control		Yes
2V0H	Auto changeover, on/off system switch and three-speed fan control		Yes

Notes:
- A means of relieving pump head pressure must be accounted for when two-way valves are used with an automatic thermostat package
- The fan runs continuously, but if the system switch is off, the fan is off

120 volt control packages

Zehnder Rittling provides a control system that includes a thermostat, control board with relays and manually operated three-speed fan switch. For fan cycle operation, the thermostat cycles the fan from the selected speed to off. No control valve is provided in this operation. For fan/valve cycle operation, the thermostat cycles the fan and control valve. The fan runs intermittently unless the speed control switch is in the off position. Valves not included in control package price.

Zehnder Rittling provides a control system that includes a thermostat, control board and manually operated three-speed fan switch. The thermostat cycles the electric control valve. The fan runs continuously. Valves not included in control package price.

Electronic on/off valve/thermostat control packages

Four pipe control, fan cycled or fan/valve cycled

Package number	Thermostat description	Fan motor speed switch location
4F0C	Auto changeover, on/off system switch and three-speed fan control	Wall mounted, integral to thermostat
4F0E	Manual changeover, heat/off/cool system switch and three-speed fan control	

Notes:
- A means of relieving pump head pressure must be accounted for when two-way valves are used with an automatic thermostat package.
- The fan cycles with demand for heating or cooling, but if the system switch is off, the fan is off.

Four pipe control, valve cycled

Package number	Thermostat description	Fan motor speed switch location
4V0C	Auto changeover, on/off system switch and three-speed fan control	Wall mounted, integral to thermostat
4V0E	Manual changeover, heat/off/cool system switch and three-speed fan control	Wall mounted, integral to thermostat

Notes:
- A means of relieving pump head pressure must be accounted for when two-way valves are used with an automatic thermostat package.
- The fan runs continuously, but if the system switch is off, the fan is off.

24 volt control packages

Zehnder Rittling provides a control system that includes a thermostat, contro board with 120V-24V, 40VA control transformer or 208V/240V/277V-24V, 50VA control transformer and relays, manually operated three-speed fan switch, and changeover switch (when required). For fan cycle operation, the thermostat cycles the fan from the selected speed to off. No control valve is provided in this operation. For fan/valve cycle operation, the thermostat cycles the fan and control valve. The fan runs intermittently unless the speed control switch is in the off position. Valve not included in control package price.

Zehnder Rittling provides a control system that includes a thermostat, control board with 120V-24V, 40VA control transformer or 208V/240V/277V-24V, 50VA control transformer, manually operated three-speed fan switch and changeover switch (when required). The thermostat cycles the electric control valve. The fan runs continuously. Valve not included in control package price.

Electronic on/off valve/thermostat control packages

Two pipe control, fan cycled or fan/valve cycled

Package number	Thermostat description	Fan motor speed switch location	Changeover switch
2F4D	On/off system switch and 120V three-speed fan control but no changeover	Wall mounted, integral to thermostat	No
2FHD	On/off system switch and 208V/240V/277V three-speed fan control but no changeover	Wall mounted, integral to thermostat	No
2F4F	Manual changeover, heat/off/cool system switch and 120V three-speed fan control	Wall mounted, integral to thermostat	Yes
2FHF	Manual changeover, heat/off/cool system switch and 208V/240V/277V three-speed fan control	Wall mounted, integral to thermostat	Yes
2F4H	Auto changeover, on/off system switch and 120V three-speed fan control	Wall mounted, integral to thermostat	Yes
2FHH	Auto changeover, on/off system switch and 208V/240V/277V three-speed fan control	Wall mounted, integral to thermostat	Yes

Notes:
- A means of relieving pump head pressure must be accounted for when two-way valves are used with an automatic thermostat package
- The fan cycles with demand for heating or cooling, but if the system switch is off, the fan is off
- Available with EC motors

Two pipe control, valve cycled

Package number	Thermostat description	Fan motor speed switch location	Changeover switch
2V4D	On/off system switch and 120V three-speed fan control but no changeover	Wall mounted, integral to thermostat	No
2VHD	On/off system switch and 208V/240V/277V three-speed fan control but no changeover	Wall mounted, integral to thermostat	No
2V4F	Manual changeover, heat/off/cool system switch and 120V three-speed fan control	Wall mounted, integral to thermostat	Yes
2VHF	Manual changeover, heat/off/cool system switch and 208V/240V/277V three-speed fan control	Wall mounted, integral to thermostat	Yes
2V4H	Auto changeover, on/off system switch and 120V three-speed fan control	Wall mounted, integral to thermostat	Yes
2VHH	Auto changeover, on/off system switch and 208V/240V/277V three-speed fan control	Wall mounted, integral to thermostat	Yes

Notes:
- A means of relieving pump head pressure must be accounted for when two-way valves are used with an automatic thermostat package
- The fan runs continuously, but if the system switch is off, the fan is off
- Available with EC motors

24 volt control packages

Zehnder Rittling provides a control system that includes a thermostat, control board with 120V-24V, 40VA control transformer or 208V/240V/277V-24V, 50VA control transformer and relays and manually operated three-speed fan switch. For fan cycle operation, the thermostat cycles the fan from the selected speed to off. No control valve is provided in this operation. For fan/valve cycle operation, the thermostat cycles the fan and control valve. The fan runs intermittently unless the speed control switch is in the off position. Valves not included in control package price.

Zehnder Rittling provides a control system that includes a thermostat, control board with 120V-24V, 40VA control transformer or 208V/240V/277V-24V, 50VA control transformer and manually operated three-speed fan switch. The thermostat cycles the electric control valve. The fan runs continuously. Valves not included in control package price.

Electronic on/off valve/thermostat control packages

Four pipe control, fan cycled or fan/valve cycled

Package number	Thermostat description	Fan motor speed switch location
4F4C	Auto changeover, on/off system switch and 120V three-speed fan control	Wall mounted, integral to thermostat
4FHC	Auto changeover, on/off system switch and 208V/240V/277V three-speed fan control	Wall mounted, integral to thermostat
4F4E	Manual changeover, heat/off/cool system switch and 120V three-speed fan control	Wall mounted, integral to thermostat
4FHE	Manual changeover, heat/off/cool system switch and 208V/240V/277V |three-speed fan control	Wall mounted, integral to thermostat

Notes:
- A means of relieving pump head pressure must be accounted for when two-way valves are used with an automatic thermostat package
- The fan cycles with demand for heating or cooling, but if the system switch is off, the fan is off
- Available with EC motors

Four pipe control, valve cycled

Package number	Thermostat description	Fan motor speed switch location
4V4C	Auto changeover, on/off system switch and 120V three-speed fan control	Wall mounted, integral to thermostat
4VHC	Auto changeover, on/off system switch and 208V/240V/277V three-speed fan control	Wall mounted, integral to thermostat
4V4E	Manual changeover, heat/off/cool system switch and 120V three-speed fan control	Wall mounted, integral to thermostat
4VHE	Manual changeover, heat/off/cool system switch and 208V/240V/277V three-speed fan control	Wall mounted, integral to thermostat

Notes:
- A means of relieving pump head pressure must be accounted for when two-way valves are used with an automatic thermostat package
- The fan runs continuously, but if the system switch is off, the fan is off
- Available with EC motors

24 volt control packages

Zehnder Rittling provides a control system that includes a factory supplied and installed 120V/24V, 40VA control transformer, manually operated three-speed fan switch and thermostat. Valves and alternate voltage (208, 230 or 277V) power supply options not included in control package price.

Zehnder Rittling provides a control system that includes a factory supplied and installed 120V/24V, 40VA control transformer, manually operated three-speed fan switch and thermostat. Valves and alternate voltage (208, 230 or 277V) power supply options are not included in the control package price.

Electronic modulating valve/thermostat control packages

Two pipe with two-way or three-way modulating valves

Package number	Thermostat description	Fan motor speed switch location
2M4A	No changeover, system switch or fan control	Unit mounted, separate from wall mounted thermostat

Notes:
- The fan runs continuously depending on position of unit mounted three-speed fan motor switch
- Available with EC motors

Four Pipe With Two-Way or Three-Way Modulating Valves

Package number	Thermostat description	Fan motor speed switch location
4M4B	Manual changeover, heat/off/cool system switch and three-speed fan control	Wall mounted, integral to thermostat
4M4D	Auto changeover, on/off system switch and three-speed fan control	Wall mounted, integral to thermostat

Notes:
- The fan runs continuously, but if the system switch is off, the fan is off
- Available with EC motors

Miscellaneous control packages

Package number	Package description	Fan motor speed switch
24VR	Unit mounted 24V relay, ready for field wiring	No
24R3		Yes, shipped loose
24VT*	Unit mounted 40VA, 120V/24V transformer with 120V pre-wired and 24V ready for field wiring	No
24T3*		Yes, shipped loose
24FC*	Unit mounted fan center includes a 40VA, 120V/24V transformer and one 24V relay with 120V pre-wired and 24V ready for field wiring	No
24F3*		Yes, shipped loose
24RP	Unit mounted relay pack includes a 40VA, 120V/24V transformer and three 24V relays with 120V pre-wired and 24V ready for field wiring	No
3SPD*	3-speed switch	Yes, shipped loose

Note:
- *Available with EC motors

Optional DDC control

Zehnder Rittling can provide a control system which includes 40VA 120V/24V transformer, manually operated three-speed fan switch with off position, fan relay and the factory mounting of a customer supplied DDC controller. The following information regarding the DDC controls and valves must be provided to Zehnder Rittling by the DDC manufacturer.

Note: The size of the controller must be no larger than 8" wide x 5" high x 2" deep.

Cut sheets
The cut sheets should include descriptions, mounting instructions, piping schematics and dimensional drawings of the controller, sensors, valves and any component to be field furnished for Zehnder Rittling to install.

Packing slip
The packing slip should include model numbers and quantity of each component supplied to Zehnder Rittling.

Schedule
The schedule including a listing of unit sizes, model numbers, accessories and tagging instructions should be supplied at the time the order is released.

Wiring diagrams
Wiring diagrams should be provided at the time the order is released instructing Zehnder Rittling how to wire the DDC controller and all accessories to meet the required control operation.

Note: Any unit containing a DDC controller will not be ETL certified.

Electric heating element construction information

The electric heating elements are located in the fan coil units in the reheat position. They are located in such a way as to prevent stratification and air bypass for optimum heating efficiency. The electric heating elements are situated above the fan discharge. This prevents access by room occupants while still allowing for easy removal for maintenance personnel.

Field wiring terminals
Field wiring terminals provide a means to easily connect with a single power source. These are suitable for copper wire and are sized in accordance with National Electrical Code.

Control systems
There are four two-pipe cooling with electric heat control systems available. Each of these is described in detail on pages 26-29.

1. **Total electric heat**
   Manual cool/heat changeover
2. **Total electric heat**
   Automatic cool/heat changeover
3. **Intermediate season electric heat**
   Automatic changeover
4. **Total electric heat**
   Automatic changeover, field supplied thermostat

Electric heating element construction

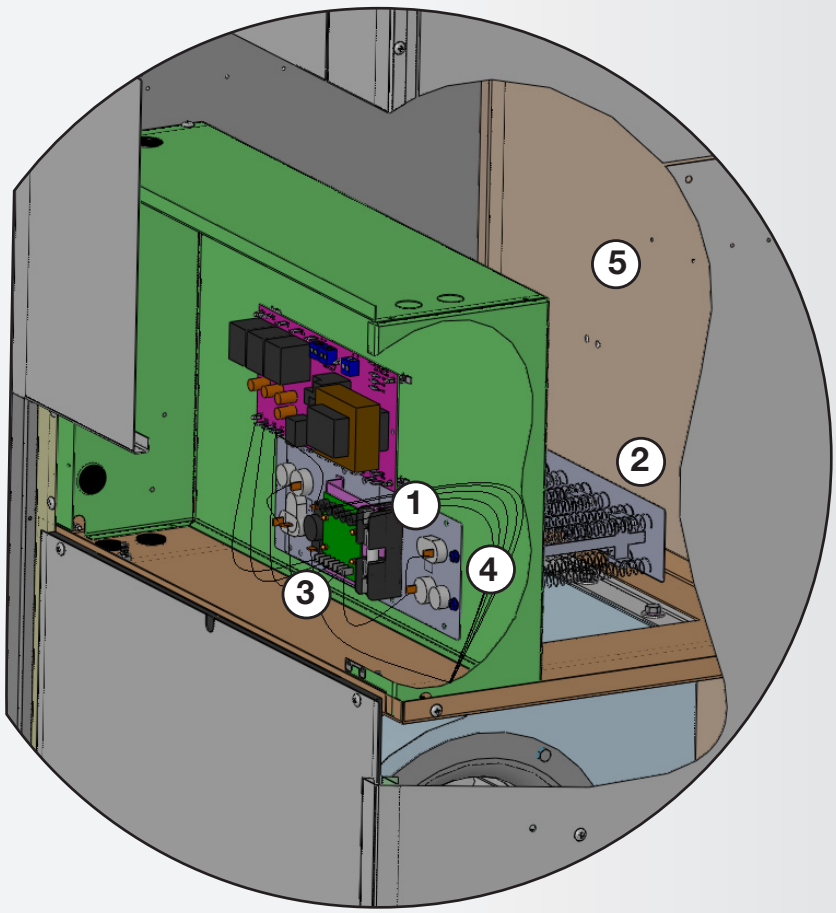
1. **Mounting**
   The electric heating elements are mounted directly to the control box. This allows the electric heat assembly to be easily removed.

2. **Heating elements**
   The electric heating element(s) have been designed to handle total electric heating and intermediate seasonal heating requirements. Electric heating elements are designed for 60 hertz/1 phase - 120, 208, 230 and 277 supply voltages.
   The electric heating elements are constructed of nickel chromium wire. They have a maximum operating temperature of 2010 °F.

3. **Linear limit switch**
   Used as the primary safety protection. It is an automatic reset thermally operated safety device. The switch operates using a long capillary tube which extends the length of the electric heating element. If the capillary senses an excessive temperature (factory preset) at any point, the electric element is de-energized. The break temperature is non-adjustable. The switch automatically re-energizes the electric heating element after the temperature falls to an acceptable range. The element will be de-energized if the capillary tube is damaged or ruptured.

4. **Fusible link**
   Used as a secondary safety protection device. These cutoffs are manually replaceable with a non conductive thermal pellet holding spring loaded contacts closed. When a preset temperature is exceeded the pellet will melt, allowing the contacts to open and break the circuit. These cutoffs are installed in the power lines of each electric heating element and open in case of failure of the primary safety device.

5. **Insulation**
   High density fiberglass insulation prevents heat from being transmitted to the back of the unit casing.



Electric heat control packages

Zehnder Rittling provides a control system that includes a thermostat with changeover control, manually operated three-speed fan switch, contactor, fuse holder with fuses, field wiring terminals, motor quick connect. The contactor, fuse holder with fuses and field wiring terminals are all pre-mounted and pre-wired to a sub panel installed in the control box. The motor quick connect allows easy removal of the blower plate and easy access to the electric heating assembly for servicing.

Chilled water cooling, single stage electric heating

Manual Changeover

■ **Cooling cycle**

The manual Cool-Heat switch is in the Cool position.
When the space temperature rises to the thermostat set point, the thermostat opens the electric cooling water valve until the space temperature is satisfied. (The cooling water valve is not included.)

■ **Heating cycle**

The manual Cool-Heat switch is in the Heat position. When the space temperature falls to the thermostat set point, the thermostat energizes the electric heating element until the space temperature is satisfied.

■ **Fan operation**

A manual fan switch with high, medium and low speeds is integral to the thermostat and controls the fan speed and the thermostat. The fan motor and thermostat are energized in any fan speed position and run continuously. The switch in the “off” position de-energizes the fan and thermostat, closing the electric cooling water valve and breaking the electric heating circuit.

■ **Thermostat**

All factory supplied thermostats are pre-wired.

Package number	Component voltage			Fan motor speed switch location	Changeover switch location
	Power supply and electric heating element	Thermostatic valve controls	Motor		
EWMA	120	120	120	Integral to thermostat	Mounted on thermostat
EWMD	120	24	120		
EWME	208		208		
EWMH	240		240		
EWMF	277		277		

Notes:

- The heating element, high temperature linear limit switch, and fusible link are not included. See electric heating element pricing.
- High voltage motors need to be ordered separately

Electric heat control packages

Zehnder Rittling provides a control system that includes a thermostat, manually operated three-speed fan switch, contactor, fuse holder with fuses, field wiring terminals, motor quick connect. The contactor, fuse holder with fuses and field wiring terminals are all pre-mounted and pre-wired to a sub panel installed in the control box. The motor quick connect allows easy removal of the blower plate and easy access to the electric heating assembly for servicing.

Chilled water cooling, single stage electric heating

Automatic changeover on space temperature

■ **Cooling cycle**

When the space temperature rises to thermostat set point, the thermostat opens the electric chilled water valve until the space temperature is satisfied. The thermostat includes a center dead band which allows the cooling water valve to close and prevent energizing of the electric heating element. (The cooling water valve is not included.)

■ **Heating cycle**

When the space temperature falls to the thermostat set point, the thermostat energizes the electric heating element until the space temperature is satisfied. The thermostat includes a center dead band which allows the electric heating element to de-energize and prevents the cooling water valve from opening.

■ **Fan operation**

A manual fan switch with high, medium and low speeds is integral to the thermostat and controls the fan speed and the thermostat. The fan motor and thermostat are energized in any fan speed position and run continuously. The switch in the “off” position de-energizes the fan and thermostat, closing the electric cooling water valve and breaking the electric heating circuit.

■ **Thermostat**

All factory supplied thermostats are pre-wired.

Package number	Component voltage			Fan motor speed switch location	Changeover switch location
	Power supply and electric heating element	Thermostatic valve controls	Motor		
EWAA	120	120	120	Integral to thermostat	None, uses thermostat dead band
EWAD	120	24	120		
EWAE	208		208		
EWAP	240		240		
EWAF	277		277		

Notes:

- The heating element, high temperature linear limit switch, and fusible link are not included. See electric heating element pricing.
- High voltage motors need to be ordered separately

Electric heat control packages

Zehnder Rittling provides a control system that includes a thermostat, manually operated three-speed fan switch, changeover switch, contactor, fuse holder with fuses, field wiring terminals, motor quick connect. The contactor, fuse holder with fuses and field wiring terminals are all pre-mounted and pre-wired to a sub panel installed in the control box. The motor quick connect allows easy removal of the blower plate and easy access to the electric heating assembly for servicing.

Chilled water cooling, hot water heating, intermediate season electric heating

Automatic changeover on supply water temperature

■ **Cooling cycle**

When the space temperature rises to thermostat set point, the thermostat opens the electric cooling water valve until the space temperature is satisfied. The thermostat includes a center dead band which allows the cooling water valve to close and prevent energizing of the electric heating element. (The cooling water valve is not included.) When the space temperature falls to the thermostat set point, the thermostat energizes the electric heating element until the space temperature is satisfied. The thermostat includes a center dead band to allow both the cooling water valve and the electric heating element to be de-energized when the space temperature is satisfied. A changeover switch is provided on the cold water supply piping to automatically maintain the cooling cycle when chilled water is present.

■ **Heating cycle**

When the space temperature falls to the thermostat set point, the thermostat energizes the electric heating element until the space temperature is satisfied. The electric heating element is locked out. A changeover switch is provided on the hot water supply piping to automatically maintain the heating cycle when hot water is present.

■ **Fan operation**

A manual fan switch with high, medium and low speeds is integral to the thermostat and controls the fan speed and the thermostat. The fan motor and thermostat are energized in any fan speed position and run continuously. The switch in the “off” position de-energizes the fan and thermostat, closing the electric water valve and breaking the electric heating circuit.

■ **Thermostat**

All factory supplied thermostats are pre-wired.

Package number	Component voltage			Fan motor speed switch location	Changeover switch location
	Power supply and electric heating element	Thermostatic valve controls	Motor		
EWAG	120	120	120	Integral to thermostat	Changeover switch(es) installed on supply line
EWAK	120	24	120		
EWAL	208		208		
EWAR	240		240		
EWAM	277		277		

Notes:

- The heating element, high temperature linear limit switch, and fusible link are not included. See electric heating element pricing.
- High voltage motors need to be ordered separately

Electric heat control packages

Zehnder Rittling provides a control system that includes contactor(s), 120V/24V, 40VA control transformer, fuse holder with fuses, field wiring terminals and an electrical block-off plate. The contactor(s), fuse holder with fuses and field wiring terminals are all pre-mounted and pre-wired to a sub panel installed in the control box of the fan coil.

Chilled water cooling, single stage electric heating

Field furnished thermostat

- **Cooling cycle**
  On a call for cooling the electric cooling water valve will open. The fan operates continuously. The cooling water valve is not included.
- **Heating cycle**
  On a call for heating the electric heating elements are energized. The fan operates continuously.
- **Fan operation**
  A manual fan switch with high, medium and low speeds is integral to the thermostat and controls the fan speed and the thermostat. The fan motor(s) and thermostat are energized in any fan speed position and run continuously. The switch in the “off” position de-energizes the fan and thermostat, closing the electric cooling water valve and breaking the electric heating circuit.
- **Thermostat**
  Field supplied for wall mounting.

Package number	Component voltage			Fan motor speed switch location	Changeover switch location
	Power supply and electric heating element	Thermostatic valve controls	Motor		
ECSA	120	120	120	Field supplied	Field supplied and mounted
ECSE	120	24	120		
ECSB	208		208		
ECSD	240		240		
ECSC	277		277		

Notes:
- The heating element, high temperature linear limit switch, and fusible link are not included. See electric heating element pricing.
- High voltage motors need to be ordered separately

Table E: Electric heat capacities

Unit size	120V/60/1					208V/60/1					230V/60/1					277V/60/1				
	No. of elements	kW	MBH	Temp rise	Amps	No. of elements	kW	MBH	Temp rise	Amps	No. of elements	kW	MBH	Temp rise	Amps	No. of elements	kW	MBH	Temp rise	Amps
03	1	1.0	3.4	9.8	8.3	1	1.0	3.4	9.8	4.8	1	1.0	3.4	9.8	4.2	1	1.5	5.1	14.7	5.4
	1	1.5	5.1	14.7	12.5	1	1.5	5.1	14.7	7.2	1	1.5	5.1	14.7	6.3	1	1.9	6.5	18.7	6.9
	1	1.9	6.5	18.7	15.8	1	2.2	7.5	21.6	10.6	1	1.9	6.5	18.7	7.9	1	2.2	7.5	21.6	7.9
	1	3.0	10.2	29.4	25.0	1	3.0	10.2	29.4	14.4	1	3.0	10.2	29.4	12.5	1	3.0	10.2	29.4	10.8
04	1	1.0	3.4	7.4	8.3	1	1.0	3.4	7.4	4.8	1	1.0	3.4	7.4	4.2	1	1.5	5.1	11.1	5.4
	1	1.5	5.1	11.1	12.5	1	1.5	5.1	11.1	7.2	1	1.5	5.1	11.1	6.3	1	1.9	6.5	14.1	6.9
	1	1.9	6.5	14.1	15.8	1	2.2	7.5	16.3	10.6	1	1.9	6.5	14.1	7.9	1	2.2	7.5	16.3	7.9
	1	3.0	10.2	22.1	25.0	1	3.0	10.2	22.1	14.4	1	3.0	10.2	22.1	12.5	1	3.0	10.2	22.1	10.8
						1	4.0	13.6	29.5	19.2	1	4.0	13.6	29.5	16.7	1	4.0	13.6	29.5	14.4
06	1	1.0	3.4	4.6	8.3	1	1.0	3.4	4.6	4.8	1	1.0	3.4	4.6	4.2	1	1.5	5.1	6.9	5.4
	1	1.5	5.1	6.9	12.5	1	1.5	5.1	6.9	7.2	1	1.5	5.1	6.9	6.3	1	1.9	6.5	8.8	6.9
	1	1.9	6.5	8.8	15.8	1	2.2	7.5	10.2	10.6	1	1.9	6.5	8.8	7.9	1	2.2	7.5	10.2	7.9
	1	3.0	10.2	13.8	25.0	1	3.0	10.2	13.8	14.4	1	3.0	10.2	13.8	12.5	1	3.0	10.2	13.8	10.8
						1	4.0	13.6	18.4	19.2	1	4.0	13.6	18.4	16.7	1	4.0	13.6	18.4	14.4
						1	5.0	17.1	23.2	24.0	1	5.0	17.1	23.2	20.8	1	5.0	17.1	23.2	18.1
08	1	1.5	5.1	6.7	12.5	1	3.0	10.2	13.4	14.4	1	4.0	13.6	17.9	16.7	1	4.0	13.6	17.9	14.4
	1	1.9	6.5	8.6	15.8	1	4.0	13.6	17.9	19.2	1	5.0	17.1	22.5	20.8	1	5.0	17.1	22.5	18.1
	1	3.0	10.2	13.4	25.0	1	5.0	17.1	22.5	24.0	2	6.0	20.5	27.0	25.0	2	6.0	20.5	27.0	21.7
						2	6.0	20.5	27.0	28.8	2	7.0	23.9	31.5	29.2	2	7.0	23.9	31.5	25.3
						2	7.0	23.9	31.5	33.7	2	8.0	27.3	35.9	33.3	2	8.0	27.3	35.9	28.9
						2	8.0	27.3	35.9	38.5						2	9.0	30.7	40.4	32.5
																2	10.0	34.1	44.9	36.1
10	1	1.5	5.1	4.2	12.5	1	4.0	13.6	11.2	19.2	1	5.0	17.1	14.1	20.8	1	5.0	17.1	14.1	18.1
	1	1.9	6.5	5.3	15.8	1	5.0	17.1	14.1	24.0	2	6.0	20.5	16.9	25.0	2	6.0	20.5	16.9	21.7
	1	3.0	10.2	8.4	25.0	2	6.0	20.5	16.9	28.8	2	7.0	23.9	19.7	29.2	2	7.0	23.9	19.7	25.3
						2	7.0	23.9	19.7	33.7	2	8.0	27.3	22.5	33.3	2	8.0	27.3	22.5	28.9
						2	8.0	27.3	22.5	38.5						2	9.0	30.7	25.3	32.5
																2	10.0	34.1	28.1	36.1
12	1	1.5	5.1	3.7	12.5	1	4.0	13.6	9.8	19.2	1	5.0	17.1	12.3	20.8	1	5.0	17.1	12.3	18.1
	1	1.9	6.5	4.7	15.8	1	5.0	17.1	12.3	24.0	2	6.0	20.5	14.8	25.0	2	6.0	20.5	14.8	21.7
	1	3.0	10.2	7.3	25.0	2	6.0	20.5	14.8	28.8	2	7.0	23.9	17.2	29.2	2	7.0	23.9	17.2	25.3
						2	7.0	23.9	17.2	33.7	2	8.0	27.3	19.7	33.3	2	8.0	27.3	19.7	28.9
						2	8.0	27.3	19.7	38.5						2	9.0	30.7	22.1	32.5
																2	10.0	34.1	24.6	36.1

Electric heat element selection

Example selection at free delivery

Example Unit size 03, (320 CFM) and a sensible heating loss of 7,000 BTU/hr.
Determine the required heating element kW using 208V incoming voltage.

Step 1 Determine the room sensible heat loss, in BTU/hr. In this example, the sensible heat loss is 7,000 BTU/hr.

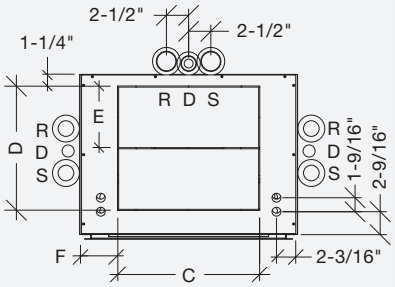
Step 2 Determine the air temperature rise for the unit size selected. Generally, the unit is selected based on cooling requirements.
The CFM for each unit size is listed in Table A on page 8. Use the formula below to determine the air temperature rise.

$$\Delta T = \frac{\text{BTU/hr}}{\text{CFM x 1.085}} \qquad \Delta T = \frac{7000}{320 \text{ x } 1.085} \qquad \Delta T = 20.2\ ^\circ\text{F required}$$

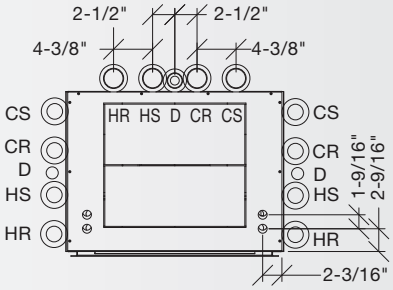
Step 3 Determine kW and number of heating elements based on air temperature rise required from Electric Heating Capacities Table.

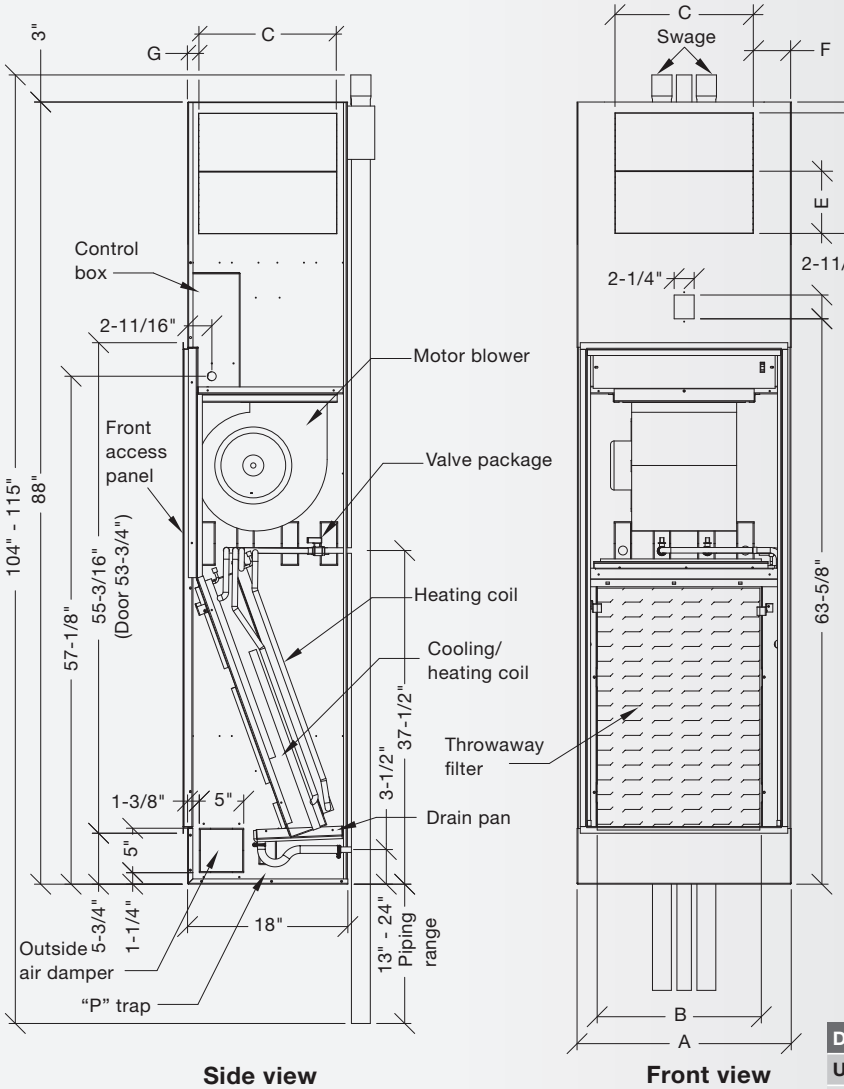
Answer Based on 20.2 °F temperature rise required, use a 2.2 kW heater element with 208V incoming voltage.

2-pipe system

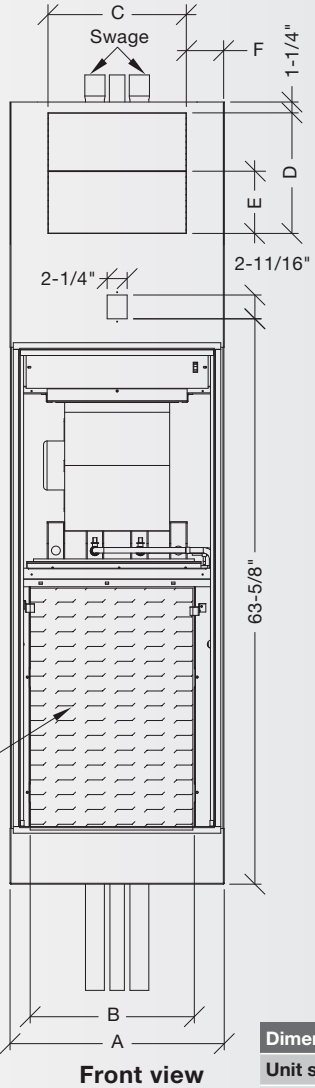


4-pipe system

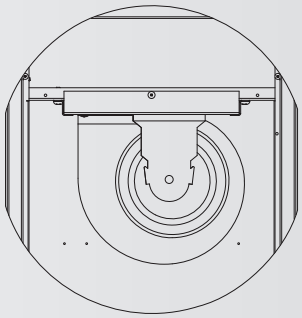




Side view



Front view



- Left: 08-12 blower/motor, viewed from front
- Above: 03-06 blower/motor, viewed from front

Acceptable riser combinations	
Supply and return (insulation)	**Condensate (insulation)**
≤2-1/2" (1/2")	≤3/4" (1/2")
≤2" (1/2")	≤1" (1/2")
≤2" (1/2")	≤1-1/2" (1/2")
≤1-1/2" (3/4")	≤3/4" (1/2")
≤1-1/4" (3/4")	≤1" (1/2")
≤1" (3/4")	≤1-1/4" (1/2")
≤1-1/4" (3/4")	≤3/4" (3/4")
≤1" (3/4")	≤1" (3/4")

Dimensional data							
Unit size	**A**	**B**	**C**	**D**	**E**	**F**	**G**
03, 04, 06	18	12-1/2	14	12	6	2	2
08, 10, 12	24	18-1/2	16	14	7	4	1

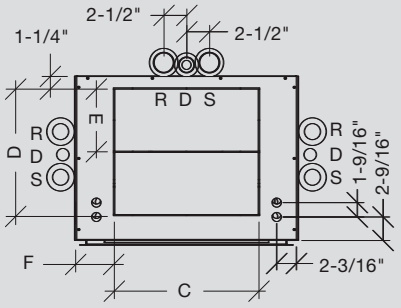
Notes:

- All dimensions are in inches
- All dimensions are +/- 1/4"
- Wiring from electrical entry point to control enclosure is furnished and installed by others in field
- Risers available from 3/4" to 2-1/2" diameter with 1/2" or 3/4" thick insulation
- Riser length is 104"-115" standard
- Back riser location shown. See arrangement drawings for available unit configurations.
- Factory mounted risers shown
- Outside air damper opening is located on left or right side of unit
- All listed dimensions are approximate and are subject to change without notice. Modifications to the product specifications must be accepted by Zehnder Rittling at its base office.

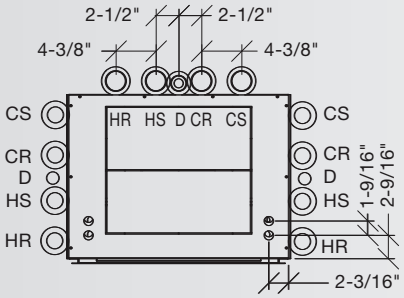
Dimensions and data

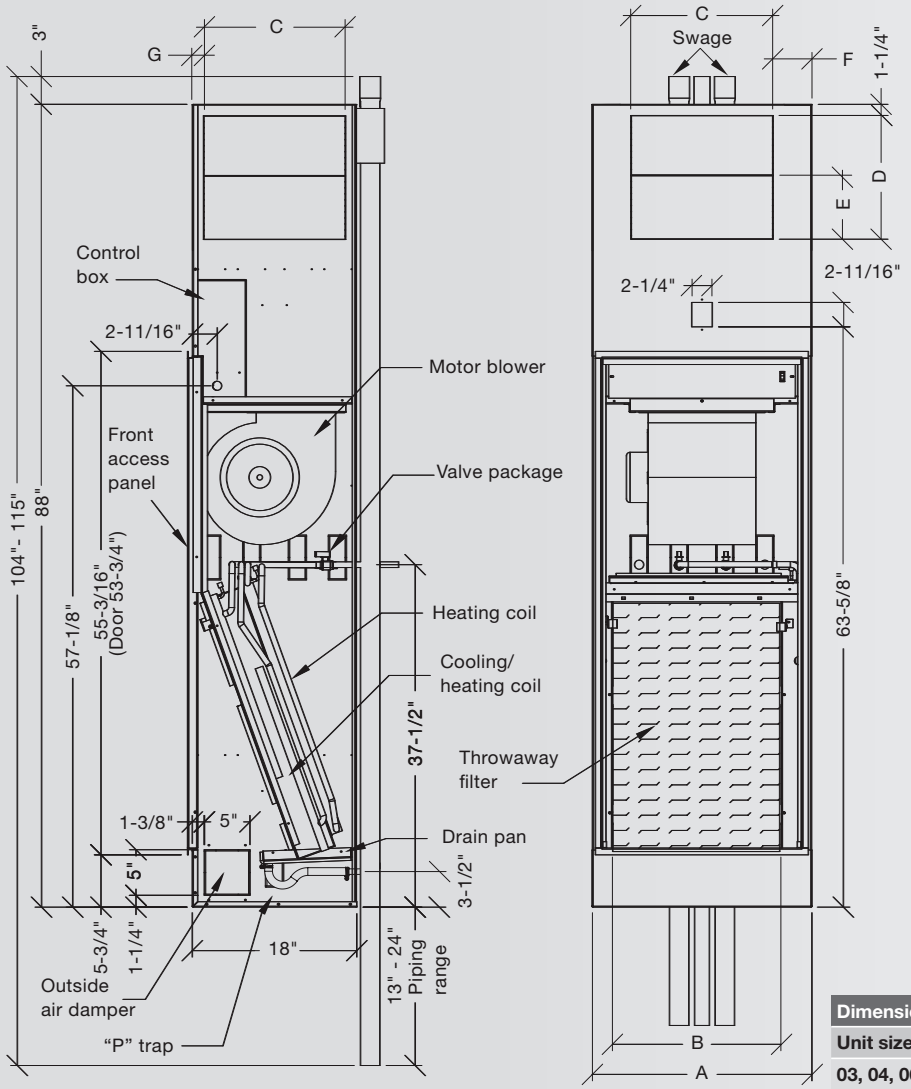
Model FVM, master

2-pipe system



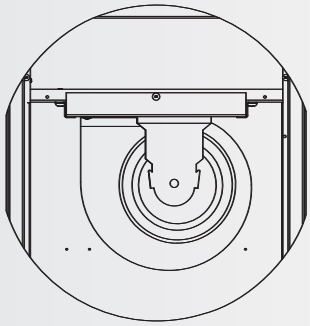
4-pipe system





Side view

Front view



- Left: 08-12 blower/motor, viewed from front
- Above: 03-06 blower/motor, viewed from front

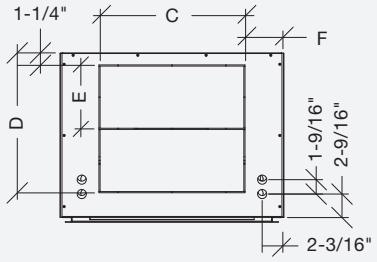
Acceptable riser combinations	
Supply and return (insulation)	**Condensate (insulation)**
≤2-1/2" (1/2")	≤3/4" (1/2")
≤2" (1/2")	≤1" (1/2")
≤2" (1/2")	≤1-1/2" (1/2")
≤1-1/2" (3/4")	≤3/4" (1/2")
≤1-1/4" (3/4")	≤1" (1/2")
≤1" (3/4")	≤1-1/4" (1/2")
≤1-1/4" (3/4")	≤3/4" (3/4")
≤1" (3/4")	≤1" (3/4")

Dimensional data							
Unit size	**A**	**B**	**C**	**D**	**E**	**F**	**G**
03, 04, 06	18	12-1/2	14	12	6	2	2
08, 10, 12	24	18-1/2	16	14	7	4	1

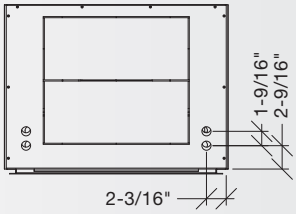
Notes:

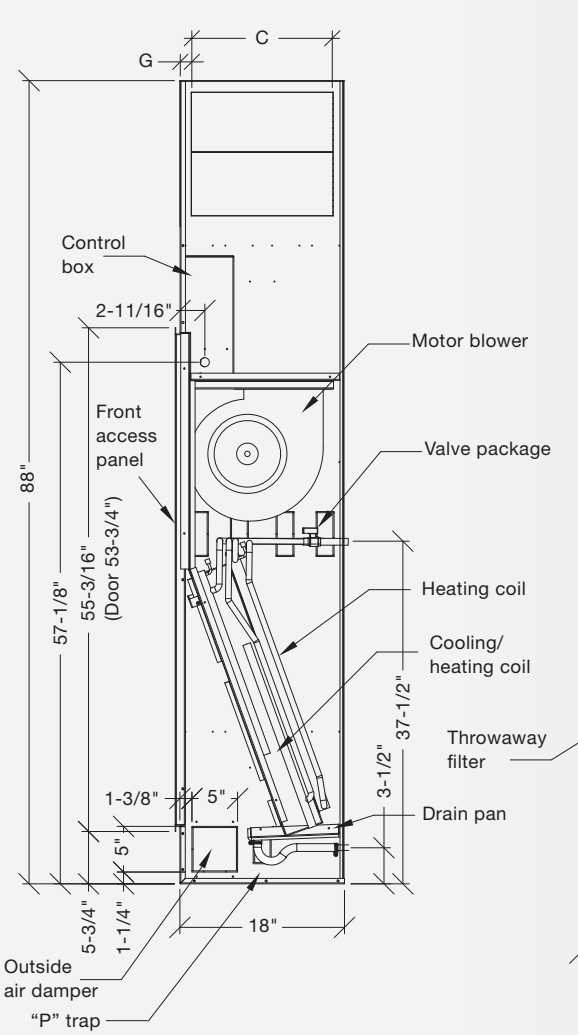
- All dimensions are in inches
- All dimensions are +/- 1/4"
- Wiring from electrical entry point to control enclosure is furnished and installed by others in field
- Risers available from 3/4" to 2-1/2" diameter with 1/2" or 3/4" thick insulation
- Riser length is 104"-115" standard
- Back riser location shown. See arrangement drawings for available unit configurations.
- Factory mounted risers shown
- Outside air damper opening is located on left or right side of unit
- All listed dimensions are approximate and are subject to change without notice. Modifications to the product specifications must be accepted by Zehnder Rittling at its base office.

2-pipe system

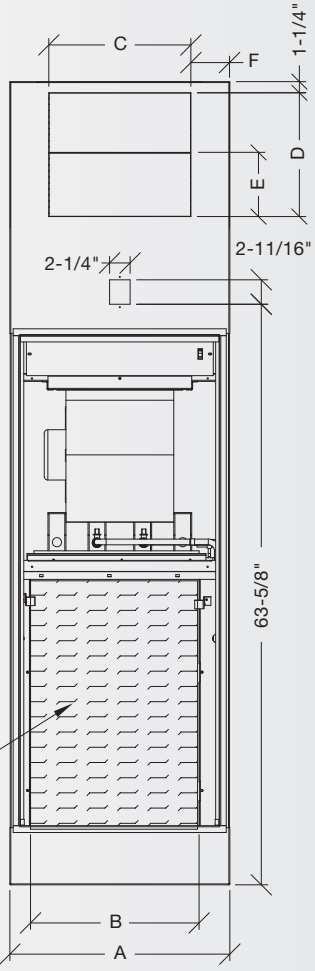


4-pipe system

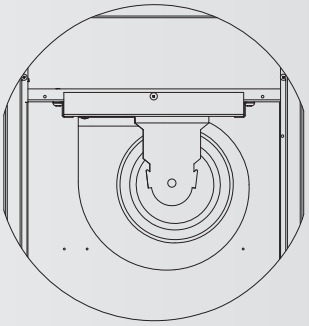




Side view



Front view



- Left: 08-12 blower/motor, viewed from front
- Above: 03-06 blower/motor, viewed from front

Dimensional data							
Unit size	**A**	**B**	**C**	**D**	**E**	**F**	**G**
03, 04, 06	18	12-1⁄2	14	12	6	2	2
08, 10, 12	24	18-1⁄2	16	14	7	4	1

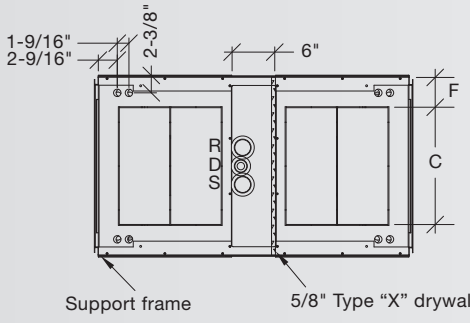
Notes:

- All dimensions are in inches
- All dimensions are +/- 1/4"
- Wiring from electrical entry point to control enclosure is furnished and installed by others in field
- Outside air damper opening is located on left or right side of unit
- All listed dimensions are approximate and are subject to change without notice. Modifications to the product specifications must be accepted by Zehnder Rittling at its base office.

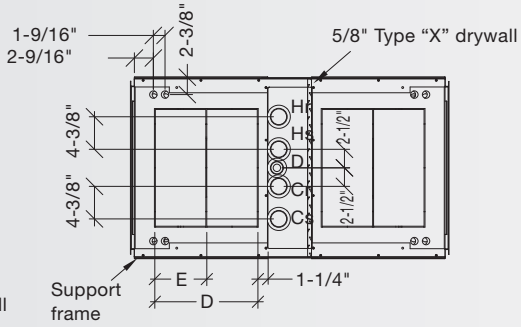
Dimensions and data

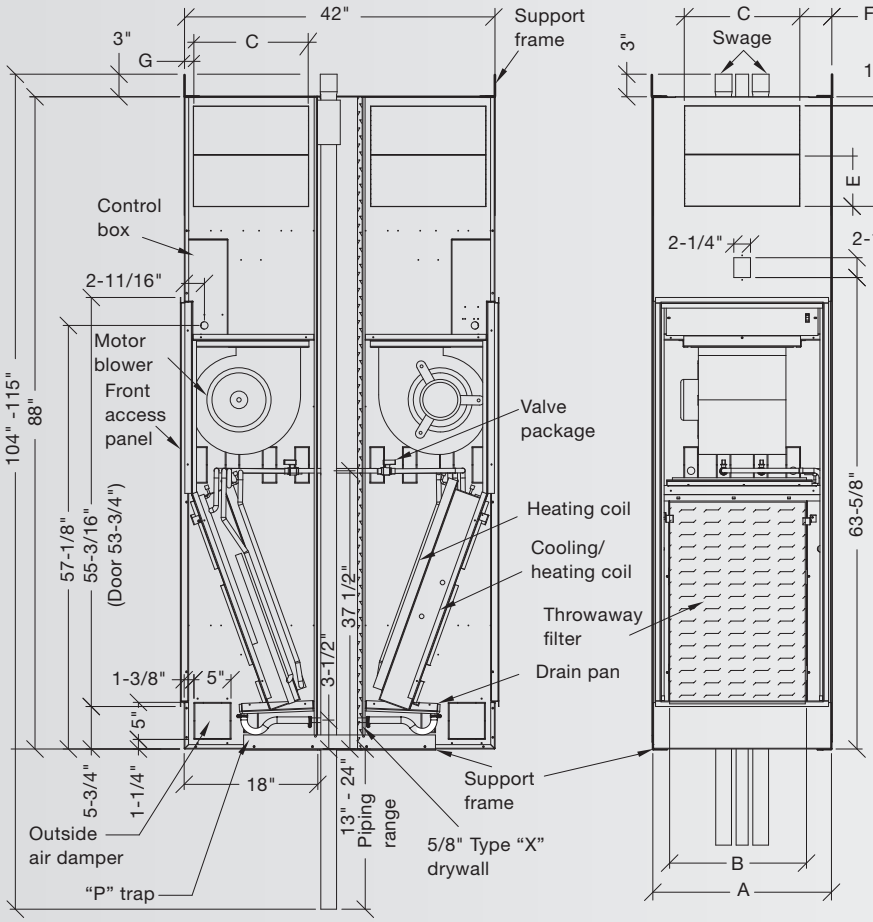
Model FVA/FVB: Back to back

2-pipe system

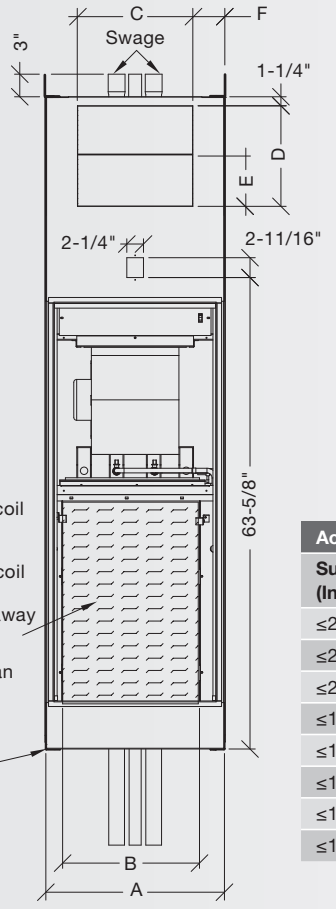


4-pipe system

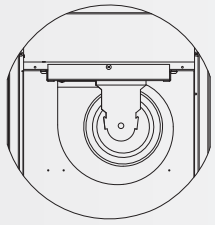




Side view



Front view



- Left: 08-12 blower/motor, viewed from front
- Above: 03-06 blower/motor, viewed from front

Acceptable riser combinations	
Supply & Return (Insulation)	**Condensate (Insulation)**
≤2-1/2" (1/2")	≤3/4" (1/2")
≤2" (1/2")	≤1" (1/2")
≤2" (1/2")	≤1-1/2" (1/2")
≤1-1/2" (3/4")	≤3/4" (1/2")
≤1-1/4" (3/4")	≤1" (1/2")
≤1" (3/4")	≤1-1/4" (1/2")
≤1-1/4" (3/4")	≤3/4" (3/4")
≤1" (3/4")	≤1" (3/4")

Dimensional data							
Unit Size	**A**	**B**	**C**	**D**	**E**	**F**	**G**
03, 04, 06	18	12-1/2	14	12	6	2	2
08, 10, 12	24	18-1/2	16	14	7	4	1

Notes:

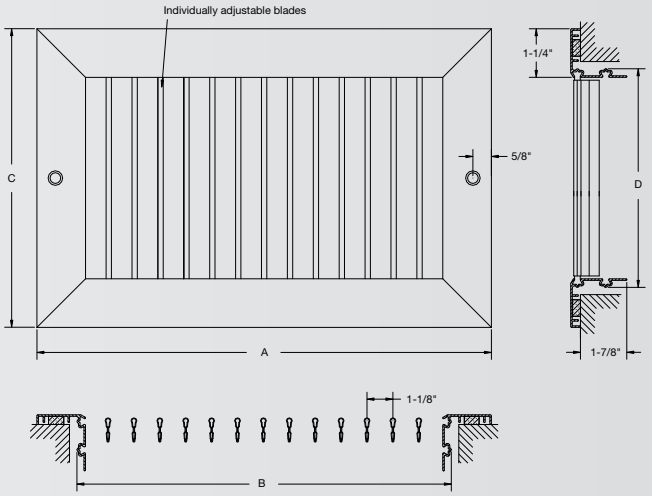
- All dimensions are in inches
- All dimensions are +/- 1/4"
- Wiring from electrical entry point to control enclosure is furnished and installed by others in field
- Risers available from 3/4" to 2-1/2" diameter with 1/2" or 3/4" thick insulation
- Riser length is 104"-115" standard
- Back riser location shown. See arrangement drawings for available unit configurations.
- Factory mounted risers shown
- Outside air damper opening is located on left or right side of unit
- All listed dimensions are approximate and are subject to change without notice. Modifications to the product specifications must be accepted by Zehnder Rittling at its base office.

Dimensions and data

Single deflection grille

Dimensional data

Grille size	A	B	C	D
14" x 16"	17-11/16"	15-11/16"	15-11/16"	13-11/16"
12" x 14"	15-11/16"	13-11/16"	13-11/16"	11-11/16"
7" x 16"	17-11/16"	15-11/16"	8-11/16"	6-11/16"
6" x 14"	15-11/16"	13-11/16"	7-11/16"	5-11/16"



Supply grille arrangements

Unit size	Height x width	
	Single supply	Double supply
03	6" x 14"	6" x 14"
04	6" x 14"	6" x 14"
06	12" x 14"	6" x 14"
08	14" x 16"	7" x 16"
10	14" x 16"	14" x 16"
12	14" x 16"	14" x 16"

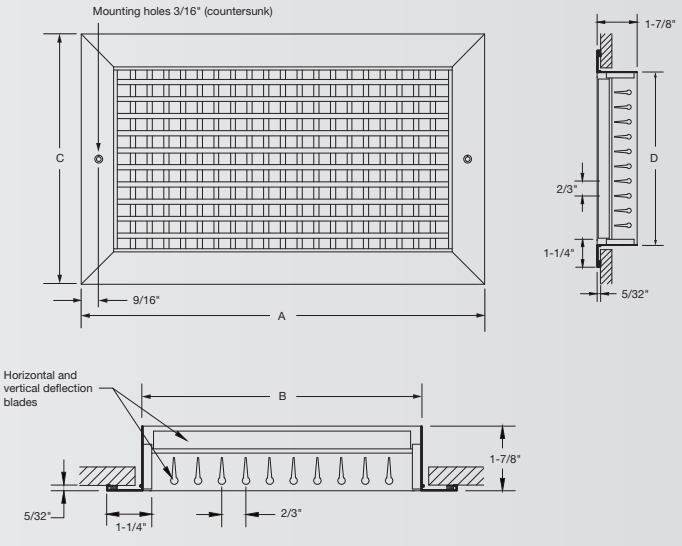
Notes
- Dimensions are in inches
- All dimensions are +/- 1/4
- Discharge grilles are shipped loose for field installation
- Construction is roll formed aluminum frame and blades
- Standard finish is powder coated and will be the same color as the return grille
- Mounting hardware included
- All listed dimensions are approximate and are subject to change without notice

Dimensions and data

Double deflection grille

Dimensional data

Grille size	A	B	C	D
14" x 16"	17-11/16"	15-11/16"	15-11/16"	13-11/16"
12" x 14"	15-11/16"	13-11/16"	13-11/16"	11-11/16"
7" x 16"	17-11/16"	15-11/16"	8-11/16"	6-11/16"
6" x 14"	15-11/16"	13-11/16"	7-11/16"	5-11/16"



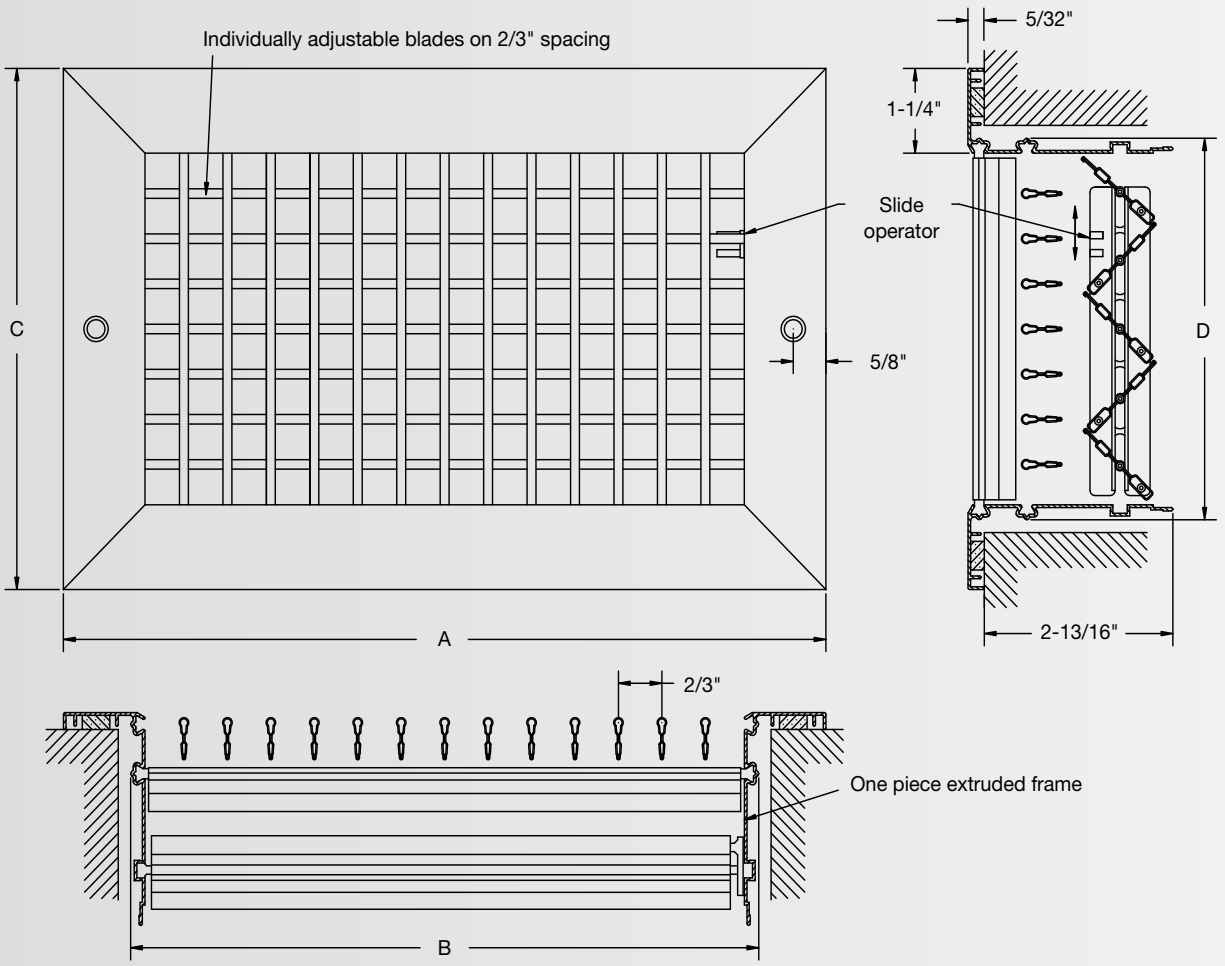
Supply grille arrangements

Unit size	Height x width	
	Single supply	Double supply
03	6" x 14"	6" x 14"
04	6" x 14"	6" x 14"
06	12" x 14"	6" x 14"
08	14" x 16"	7" x 16"
10	14" x 16"	14" x 16"
12	14" x 16"	14" x 16"

Notes
- Dimensions are in inches
- All dimensions are +/- 1/4
- Discharge grilles are shipped loose for field installation
- Construction is roll formed aluminum frame and blades
- Standard finish is powder coated and will be the same color as the return grille
- Mounting hardware included
- All listed dimensions are approximate and are subject to change without notice

Dimensions and data

Aluminum discharge grille, double deflection with opposed blade damper



Dimensional data

Grille size	A	B	C	D
14" x 16"	17-11/16"	15-11/16"	15-11/16"	13-11/16"
12" x 14"	15-11/16"	13-11/16"	13-11/16"	11-11/16"
7" x 16"	17-11/16"	15-11/16"	8-11/16"	6-11/16"
6" x 14"	15-11/16"	13-11/16"	7-11/16"	5-11/16"

Supply grille arrangements

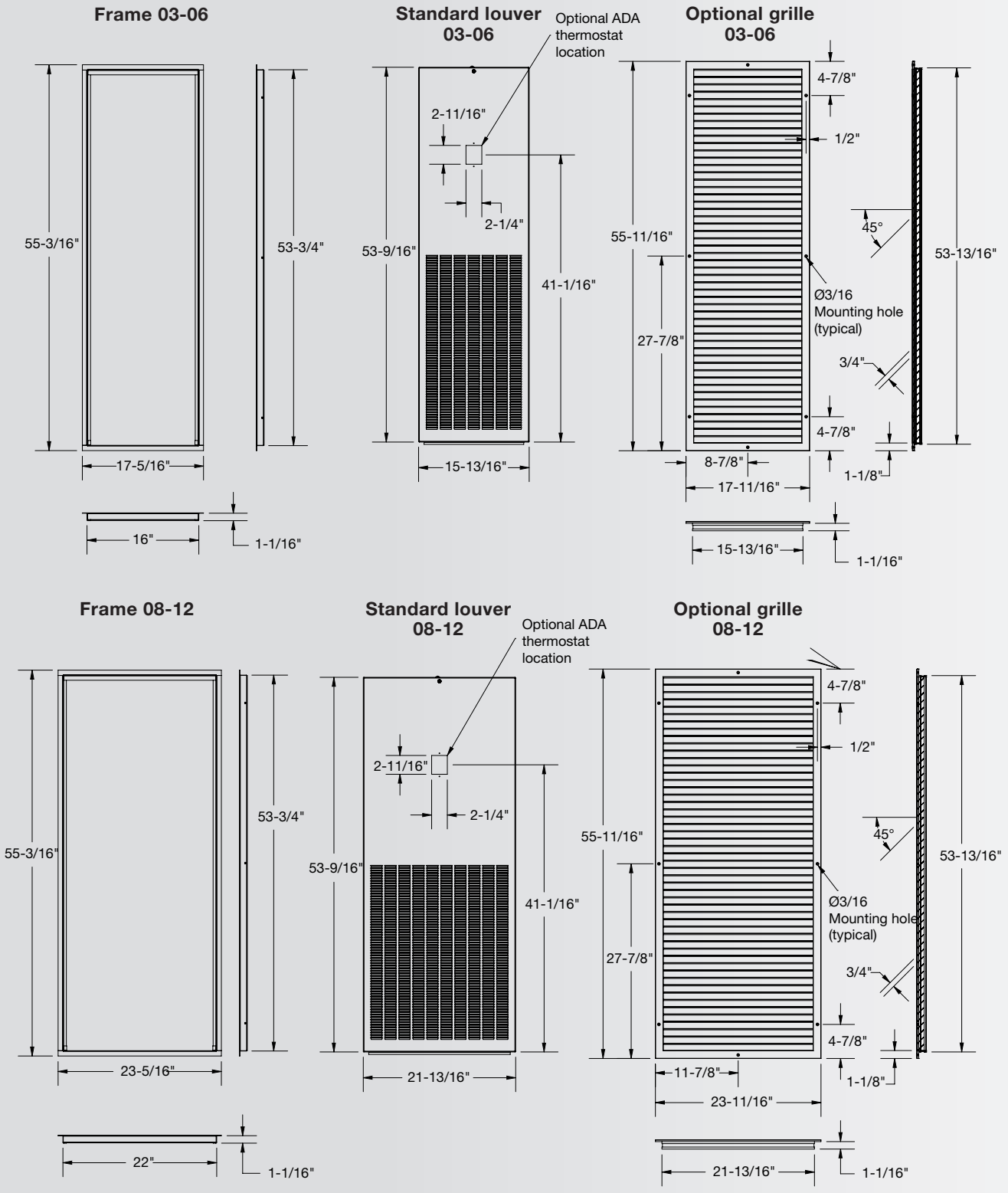
Unit size	Height x width	
	Single supply	Double supply
03	6" x 14"	6" x 14"
04	6" x 14"	6" x 14"
06	12" x 14"	6" x 14"
08	14" x 16"	7" x 16"
10	14" x 16"	14" x 16"
12	14" x 16"	14" x 16"

Notes

- All dimensions are in inches
- All dimensions are ± 1/4
- Discharge grilles are shipped loose for field installation
- Vertical blades in the front, horizontal blades in the back, both individually adjustable and on 2/3" spacing
- Opposed blade damper with slide operator
- Aluminum roll formed blade with semi-airfoil design
- Pressure fit nylon pivot pins (rattle-free and non-loosening)
- Aluminum extruded frame with mechanically locked corners
- Countersunk screw holes
- Standard finish is powder coated and will be the same color as the return grille
- Mounting hardware included
- All listed dimensions are approximate and are subject to change without notice

Dimensions and data

Return air grille



Notes:

- Frame and return grilles are shipped loose for field installation
- Optional grille does not come with a frame
- Contact the factory regarding extended front panels for additional control panel access and/or ADA mounting of thermostats
- All listed dimensions are approximate and are subject to change without notice. Modifications to the product specifications must be accepted by Zehnder Rittling at its base office.

Mechanical specifications
Models FVH, FVM, FVS and FVA/FVB

General
Furnish and install Vertical Hi-Stack Fan Coil Units where indicated on the plans and in the specifications, with required mounting components and accessories. All units shall be capable of meeting or exceeding the scheduled capacities for cooling, heating and air delivery. Units shall be ETL certified for the United States and Canada in compliance with UL/ANSI Standard 1995 and CSA C22.2 No. 236-95, and be certified as complying with ARI Standard 440-2008.

Construction
All unit cabinet panels shall be fabricated of 20-gauge galvanized steel panels. All cabinet panels shall be insulated with 1/2" thick 2 lb density matt-faced fiberglass [1/2" thick foil faced fiberglass with scrim and taped edges to prevent any fibers from reaching the airstream] [1/2" thick elastomeric closed cell foam insulation]. Insulation shall conform to NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E-84 or UL 723. Additionally, insulation shall comply with Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21.

All unit panels shall have knockouts for supply air openings and riser slots to facilitate the field conversion of riser location and supply air grille location.

All units shall be designed to have drywall applied directly to the unit surface.

- Option: Back-to-back units shall have model FVA and FVB units joined together by a nominal six-inch wall that contains the supply, return and condensate risers.

The FVB unit will have a 5/8" layer of type-X gypsum board mechanically fastened to the unit wall adjacent to the risers. The riser penetrations in the partition wall will be sealed with a fire-retardant caulk.

Where a one hour rating of the partition between the units is required, a second layer of type-X gypsum board shall be mechanically fastened to the FVA unit wall adjacent to the risers. The riser penetrations in the partition walls will be sealed with a fire-retardant caulk. The unit shall be fabricated in compliance with ANSI/UL-1479 Standard Test Method for Fire Tests of Through Penetration Fire Stops.

- Option: Supply air opening knockouts shall be factory sealed and left in place during shipping and staging at the job site.

The front access panel shall be fabricated of not less than 18-gauge [16-gauge] [14-gauge] cold rolled steel and include reverse stamped louvers, leaving a smooth exterior surface. [Provide an architectural aluminum double deflection discharge grille with a powder coated paint finish to match cabinet color. Liquid coat paint shall not be acceptable.] The front panel shall be attached with a single tamper-proof Allen-head quarter turn fastener to allow for easy removal and access for service.

The front panel mounts within a frame that is flush with the wall. A front panel that protrudes from the wall is not acceptable.

- Option: Provide an architectural grade double deflection [single deflection] [double deflection opposed blade damper] aluminum discharge grille.

Painted finish
All front return panels, mounting frames and supply air grilles shall be finished with a standard ivory epoxy powder coat paint. Optional colors can be selected from the Zehnder Rittling Color Chart. Liquid coat paint shall not be acceptable. Custom colors are also available with the submission of a color chip for color match.

Sound
Units shall have published sound power level data tested in accordance with ARI Standard 350-2000 for non-ducted units.

300 CFM and 400 CFM nominal units shall meet NC-27 sound criteria on high speed.

800 CFM nominal units shall meet NC-35 sound criteria on high speed.

600 CFM and 1000 CFM nominal units shall meet NC-45 sound criteria on high speed.

1200 CFM nominal units shall meet NC-54 on high speed.

- Option: For units with multiple outlets, include an sheet metal baffle, insulated on 2 sides, inside the discharge plenum to break the sight lines between the two discharge outlets and to attenuate room noise that could be transmitted through the openings.

Power

Units shall not exceed scheduled power consumption.

Fan and motor

Unit fan shall be dynamically balanced, forward curved, DWDI centrifugal type constructed of galvanized steel for corrosion resistance. Motors shall be permanent split-capacitor [electronically commutated high-efficiency, programmable brushless DC], totally enclosed, tap wound for 3-speed, permanently lubricated sleeve bearing, type with automatic reset integral thermal overload protection and resiliently mounted. High static motors are available for ducted applications. Shaded pole motors are not acceptable. Single speed motors are not acceptable. Prior to shipping, all motors shall be assembled, factory tested and installed in the unit

The fan/motor assembly shall be constructed of 18-gauge galvannealed steel and installed in a z-channel mounting frame for ease of sliding fan/motor deck in and out through the front panel. Each fan/motor assembly shall be fastened by no more than 1 screw. The motor shall have a quick connect to allow service and removal without the need for tools.

Drain pan

Primary condensate drain pans shall be single wall, fire retardant ABS plastic for corrosion resistance and extend under the entire coil section. Drain pans shall be of one piece construction and be positively sloped in 2 directions for condensate removal. An easily removable rubber p-trap shall be furnished, factory piped to the condensate drain riser, held in place by 2 compression clamps.

The primary drain pan shall be externally insulated with elastomeric closed cell foam insulation. The insulation shall carry no more than a 25/50 Flame Spread and Smoke Developed Rating per ASTM E-84 and UL 723 and an Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21. Internally sprayed insulation will not be acceptable.

- Option: Provide a primary drain pan constructed entirely of 20-gauge stainless steel for superior corrosion resistance.
- Option: Drain pan to be easily removable by sliding out from c-channel and shall be fastened by no more than 2 screws. Drain pan access that requires the removal of coils is not acceptable.
- Option: Provide a condensate level switch to prevent unit from operating if the drain becomes blocked.
- Option: Provide a condensate pump with GFCI to continuously remove up to 5.0 gph.

Coils

All cooling and heating coils shall optimize rows to meet the specified capacity. Coils shall have 1/2" OD seamless copper tubes and shall be mechanically expanded to provide an efficient, permanent bond between the tube and aluminum fin. Minimum copper tube thickness shall be 0.016".

Fins shall have high efficiency aluminum surface optimized for heat transfer, air pressure drop and carryover. Minimum fin thickness shall be 0.0045". Lanced fins shall not be acceptable.

All coils shall be tested at 350 PSIG air pressure under water, and rated for a maximum 300 PSIG working pressure at 200°F. Coils shall be circuited for counter flow to maximize unit efficiency.

All water coils shall be designed to connect with ½" nominal pipe connections.

Coil casing shall be fabricated from galvanized steel [stainless steel].

Heating coils shall be furnished in the re-heat position.

Steam coils shall be standard single tube steam type suitable for temperatures above 35°F and 15 PSIG steam pressure.

All water coils shall be provided with a manual air vent [automatic air vent] fitting to allow for coil venting.

Mechanical specifications
Models FVH, FVM, FVS and FVA/FVB

Filters
All units shall be furnished with a minimum 1" nominal glass fiber throwaway [1" pleated MERV 7] [1" cleanable aluminum mesh] filter. Filters shall be tight fitting to prevent air bypass.

Electrical
Units shall be furnished with single point power connection. All electrical terminations to be made at control board using spade connectors.

- Option: Provide 24 VAC fan relays with 40 VA transformer as integral part of control board. Fan relays designed to operate in conjunction with factory provided [field provided] 24 V thermostat. Fan relays designed to accept 120, 208, 230, or 277 V input power.

Relays shall operate with generic non-digital [digital, non-programmable] [digital, programmable] thermostat designed to control up to three independently energized fan speeds. Thermostat will be provided with wiring harness complete with quick connect and pre-wired to terminal blocks.

- Option: Provide a service disconnect switch to isolate power from the unit during maintenance.
- Option: Provide a manual motor starter to provide overload protection for the motor.

Primary internal wiring and testing shall be conducted at the factory. All units shall be shipped with wiring diagrams.

Electric heat
Furnish an electric resistance heating assembly as an integral part of the fan coil unit, with the heating capacity, voltage and kilowatts scheduled.

The heater and unit assembly shall be listed for zero clearance and meet all NEC requirements, and be ETL listed with the unit as an assembly in compliance with UL/ANSI Standard 1995.

All heating elements shall be constructed of nickel chromium resistance wire with a maximum operating temperature of 2010°F. Each electric heating element shall be mounted to a continuous 18-gauge galvanized steel plate. Electric heating elements shall be located in the reheat position, shall be non-accessible to room occupants and is easily removed through the control box.

All heaters shall include over temperature protection consisting of an automatic reset primary thermal limit safety switch and back-up secondary thermal limit safety device. All heaters shall be single stage.

Separate fusing is provided for each element for overcurrent protection.

All internal wiring shall be rated for 105°C minimum.

Piping packages
Provide a standard factory assembled and mounted valve piping package to consist of a 2 or 3-way, on/off, motorized electric control valve and two ball isolation valves.

Control valves shall be piped normally closed to the coil. Control valves shall be wired to terminal blocks or unit mounted thermostat, when provided, through quick connects to allow service and replacement of valves. Maximum entering water temperature on the control valve shall be 200°F, and maximum operating pressure shall be 300 PSIG.

- Option: Piping packages shall include stainless steel braided hoses to allow for thermal expansion within the unit cabinet. The hose shall be EPDM inner lined and Kevlar® reinforced, with stainless steel FNPT swivels and/or fittings. The hoses shall be rated for a maximum 450 PSIG working pressure at 250°F, and shall conform to NFPA 90A and carry no more than a 25/50 Flame Spread and Smoke Developed Rating, per ASTM E-84 and UL 723.
- Option: Unions shall be provided to allow easy removal of piping package from unit without the need for brazing or cutting pipe.
- Option: Provide 3-wire floating point modulating control valve (fail-in-place), in lieu of standard 2-position control valve wIth factory assembled valve piping package.
- Option: Provide proportional 0-10 VDC modulating control valve, in lieu of standard 2-position control valve with factory assembled valve piping package.

- Option: Provide high pressure close-off actuator for 2 or 3-way on/off control valve. Maximum close-off pressure is 75 PSIG.
- Option: Provide an adjustable flow control device for each piping package.
- Option: Provide a fixed flow control device for each piping package.
- Option: Provide pressure-temperature ports (P/T) for each piping package to allow measurement across the coil.

Piping packages shall be completely factory assembled including interconnecting pipe and factory tested for leaks. The valve packages are to be located in a serviceable location over the coil and primary drain pan. Valves that are tucked down behind coil(s) are unacceptable.

Risers

Furnish chilled and hot water supply and return risers mounted to the unit. Risers shall be Type-M seamless copper tube and include 3" deep swaged connections at the top for connection to the unit above. Slip couplings are not acceptable.

- Option: Provide Type-L copper risers that meet or exceed the requirements stated above.

Risers shall be insulated with 1/2" closed cell foam insulation covering the entire riser. Insulation shall conform to NFPA 90A and carry no more than a 25/50 Flame Spread and Smoke Developed Rating, per ASTM E-84 and UL 723.

- Option: Provide 3/4" closed cell foam insulation that meets or exceeds the requirements stated above.

Condensate drain risers shall be Type-M seamless copper tube and meet the requirements stated above.

- Option: Risers shall be factory fabricated, bundled, and tagged separate from the fan coil units, allowing for shipment and installation of risers prior to the fan coil units.

Outside air damper

Provide a manual [two position motorized] outside air single blade damper integral to the unit.

[A synchronous motor interlocked with the fan shall open the outside air damper automatically when the fan starts. If there is a loss in power or the blower stops, the damper shall return to a closed position.]

Units shall be manufactured in accordance with ISO 9001:2008 standards established and maintained by Zehnder Rittling.

Warranty

Zehnder Rittling guarantees its products to be free from defects in material and workmanship for a period of two years from date of shipment from our factory.

Should there be any defects in the good(s), the purchaser should promptly notify Zehnder Rittling. Upon receipt of written consent from Zehnder Rittling, the purchaser shall return the defective good(s) to the factory for inspection with freight prepaid. If inspection shows the goods to be defective, Zehnder Rittling will at its discretion repair or replace the said item(s).

Defects arising from damage due to shipment, improper installation, negligence or misuse by others are not covered by this warranty.

This warranty is extended only to the original purchaser from Zehnder Rittling.

IMPORTANT: Approved submittal documentation, specific to each project, supersedes the general guidelines contained within this document.

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Zehnder Rittling · 100 Rittling Boulevard · Buffalo, NY USA 14220
T 716-827-6510 · F 716-827-6523 · sales@zehnder-rittling.com
www.zehnder-rittling.com